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OBJECTS OF THE SOCIETY

The objects of the American Geographical Society are to collect and disseminate geographical information by discussion, lectures, and publications; to establish in the chief city of the United States a place where may be obtained accurate information on every part of the globe; and to encourage such exploring expeditions as seem likely to result in valuable discoveries in geography and the related sciences.

The American Geographical Society is the oldest geographical society in the United States. When it was founded, in 1852, there were but twelve similar societies in the world. Now it exchanges publications with more than four hundred scientific associations. The Society issues a monthly magazine of unusual interest called *The Geographical Review.* It has also a large and growing library—one of the most important geographical libraries of the world; thousands of maps and charts; and a remarkable collection of atlases of the sixteenth, seventeenth, and eighteenth centuries.

Travelers, men of science, and others properly accredited are welcome at the rooms of the Society and may freely use the book and map collections.

Two gold medals have been founded by the Society, the *Cullum Geographical Medal* and the *Charles P. Daly Medal,* which are awarded from time to time to explorers, writers, and men of science who have contributed to the advance of geographical knowledge.

In addition it awards the *David Livingstone Centenary Medal,* founded by the Hispanic Society of America.

The qualifications for Fellowship are an interest in exploration and travel, in the spread of geographical knowledge, and in the advancement of science.

A Fellow is entitled to the use of the Library, Reading and Map Rooms; to admission to all lectures and exhibitions; and to the Society's current publications, which include, besides the magazine, occasional books and maps.

The annual dues are ten dollars.

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New York...

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THE
GEOGRAPHICAL REVIEW

VOL. I JANUARY, 1916 NO. 1

THE GEOGRAPHICAL REVIEW

The Geographical Review now succeeds the *Bulletin of the American Geographical Society* as the Society's monthly magazine. The old title—maintained since 1852—did not adequately express the broad field of geographical observation and comment covered by the *Bulletin* in later years. Moreover, it is the intention of the Society to improve its publication still further, to broaden the range and deepen the intellectual interest of its articles, and to give its notes and reviews a more critical and scholarly quality. The breadth of its interest should make *The Geographical Review* the medium of expression both of the scientific geographers of this country and of that growing number of public men and women interested in the diversified fields of exploration and discovery, travel, commerce, and human development.

The Geographical Review hopes to serve the cause of education. Because the physical forces of the earth are so intimately bound up with human affairs geographical science should have a prominent place in our educational system. For many years university and college geographers have found the *Bulletin* a reservoir of useful material. Probably not more than two or three foreign publications of the highest rank have proved equally useful to scientific men in this field.

To become still more useful to education the Society's staff has been organized for the systematic development of the best geographical material from all parts of the world. Over six hundred periodicals, either primarily geographical or containing material of geographical interest, are received each month. These are now thoroughly worked over and the results published in classified form. Probably no other geographical society carries on work of equal thoroughness and range at the present time.

In practically each issue of *The Geographical Review* we shall publish a notable map, as often as possible in color. During the past half year we have produced a few maps of this order, and an additional number of sketch maps in black and white, which have brought us frequent and favorable comment from journalists, historians, anthropologists, and public men in many sections of the world.

Through the long-continued support of the patrons of the Society we now possess the largest and most valuable collection of geographical books and maps in the western hemisphere. In time we hope to have the largest and best in the world. Through the medium of strong papers, and critical notes and reviews we wish to make these collections dynamic. It is the essence of the modern idea that knowledge is of value only when transformed into action that tends to realize the aspirations of humanity. It is precisely this view that the Society has always taken. We wish to turn even more effectively than in the past to the world outside our walls.

Our traditions point the way. We have the advantage of historical association with a large number of great names. On our roll of honor are Scott, Peary, Amundsen, Shackleton, Nansen, Sir John Murray, and the Duke of the Abruzzi. Among our fellows and honorary and corresponding members we have been proud to count Bayard Taylor, Du Chaillu, Vivien de Saint-Martin, the explorer Chandless, William H. Seward, Sir Roderick Murchison, General John C. Fremont. Among our past presidents have been George Bancroft, Henry Grinnell, and Judge Charles P. Daly. Any organization which has had associated with it so large a number of men distinguished in public life must have peculiarly high and enduring qualities. These men represent an investment of spirit, of ideals, of faith in human service, immeasurably superior to the material investment represented by our beautiful building and grounds and our great collection of maps and books. Without such traditions we should not have reached our present position of influence. In the development of *The Geographical Review* we shall therefore hold steadfastly to our founders' aims to enrich the intellectual life of our time and to serve its idealistic purposes no less than its practical ends.

THE OAK TREE AND MAN'S ENVIRONMENT

By J. RUSSELL SMITH, Ph.D.
University of Pennsylvania

We are beginning to develop a new mental attitude toward the universe, toward our environment. This is the attitude of scientific testing and scientific utilization—a question of great importance to the economic geographer, who is primarily interested in the study of lands as the home of man. In the weighing of lands to determine their value to man, the geographer has had to change his scales every time science has put into his hands a new set of weights. This has happened frequently, and with the advance of science it is likely to keep on happening with increasing frequency. Since coal has entered into use, great shifts of industry, population, and power have resulted. Coal has entered into our thinking, and we have made an entirely new appraisal of the countries of the world. Water-power is now causing another revaluation of lands.

Cement affords an excellent example of the method by which new environmental factors enter into our lives. The discovery of the art of reinforcing concrete with steel opened up suggestive but undefined possibilities. What were these possibilities? Thousands of tests in many laboratories helped to give the answer on its technical side. The new works of the civil engineers gave the answer on the structural side, while geologists and mineralogists scoured the world to locate the materials for the making of cement.

The comfort of man has been increased, and little-used districts have quickly become populous through the sudden fervor of our investigation and adoption of cement after the discovery of the art of making reinforced concrete had, within a decade, made it an effective part of the environment. Perhaps this is to be our method. It should be. For every discovery, as in the case of cement, we should have the means at hand to search the earth and experimentally test out all promising leads.

Thus may man's life become adjusted to his environment, and thus may his activities conserve and improve it. The consistent adoption of such a philosophic attitude toward the earth will present a strong contrast to our past. In the past we have utilized our environment in the most haphazard way, and as to the concept of the whole environment as an influence, why, the race seems never to have thought of it.

What is our environment? Without attempting to define it fully, I will venture the somewhat definitive statement that, for man as an animal inhabiting the earth, those environments are good which permit the winning of a sufficient supply of nourishing food and at the same time permit the maintenance of health and energy.

Man knows far less about his relations to his environment as an *animal* than he does about his relation to his environment as a maker and user of cement. I am glad to note that there are signs among geographers of increasing interest in the study of the environment as it affects man. Those concerned for the welfare of the race should hope that our mass of working knowledge may be increased by the concept that the environment is something to be reckoned with, as is the transportation service or the supply of moving-picture shows. Thus far man has thrown himself about the earth's surface most blindly, more blindly by far than the migrating wild geese. In the main the geese know (environmentally) where they are going. They go into lands that are good for geese and other lands they leave alone. It is peculiar how the young gosling has been so much better taught than the young man. Man has repeatedly and continually gone into environments that destroy life through disease or diminish culture through the destruction of energy. Man is still doing it with all the reckless abandon of the age of the conquistadors. The average high-school or college graduate in the United States today has a strangely uniform concept of the earth. He comes into the professor's office and talks of seeking his fortune in South America as though the Spanish language were the only difference between that much-praised continent and Wisconsin or Pennsylvania. Such happenings are an impeachment alike of science, for neglecting the study of environment, and of education, for neglecting to teach youth some of the important environmental facts that appear to be firmly fixed in the minds of the young of the wild goose. I rejoice that investigation of the environment as such has begun. May it speedily increase until man knows as much about regions as a home for the race as he now knows about them as homes for cement factories. This knowledge may help man to take as good care of himself then as he now does of a cement factory.

Along with use of the earth comes inevitably the idea of conserving the earth and its resources. The two ideas should be inseparable, and it is one of the tasks of civilization to make them so. We may use and destroy as the savage and the civilized alike have so often done, thus keeping alive the saying "after man the desert"; or we may use the earth and leave it almost unimpaired, in some respects even much improved by our tenancy. This idea of scientific utilization of our environment will claim much more of our attention if we look forward to a long sojourn of a numerous race of men upon this planet. Here again we have shown ourselves much the inferiors, cosmically speaking, of our planetary brethren, the geese. We have destroyed. They have not. The aim of the so-called conservation movement is that the group shall compel the individual to cease destroying the environment. This movement has great reason for being, but it has not yet gone very far. Except for some tree planting, the conservation idea has, up to the present, produced little but a string of thou-shalt-nots, and

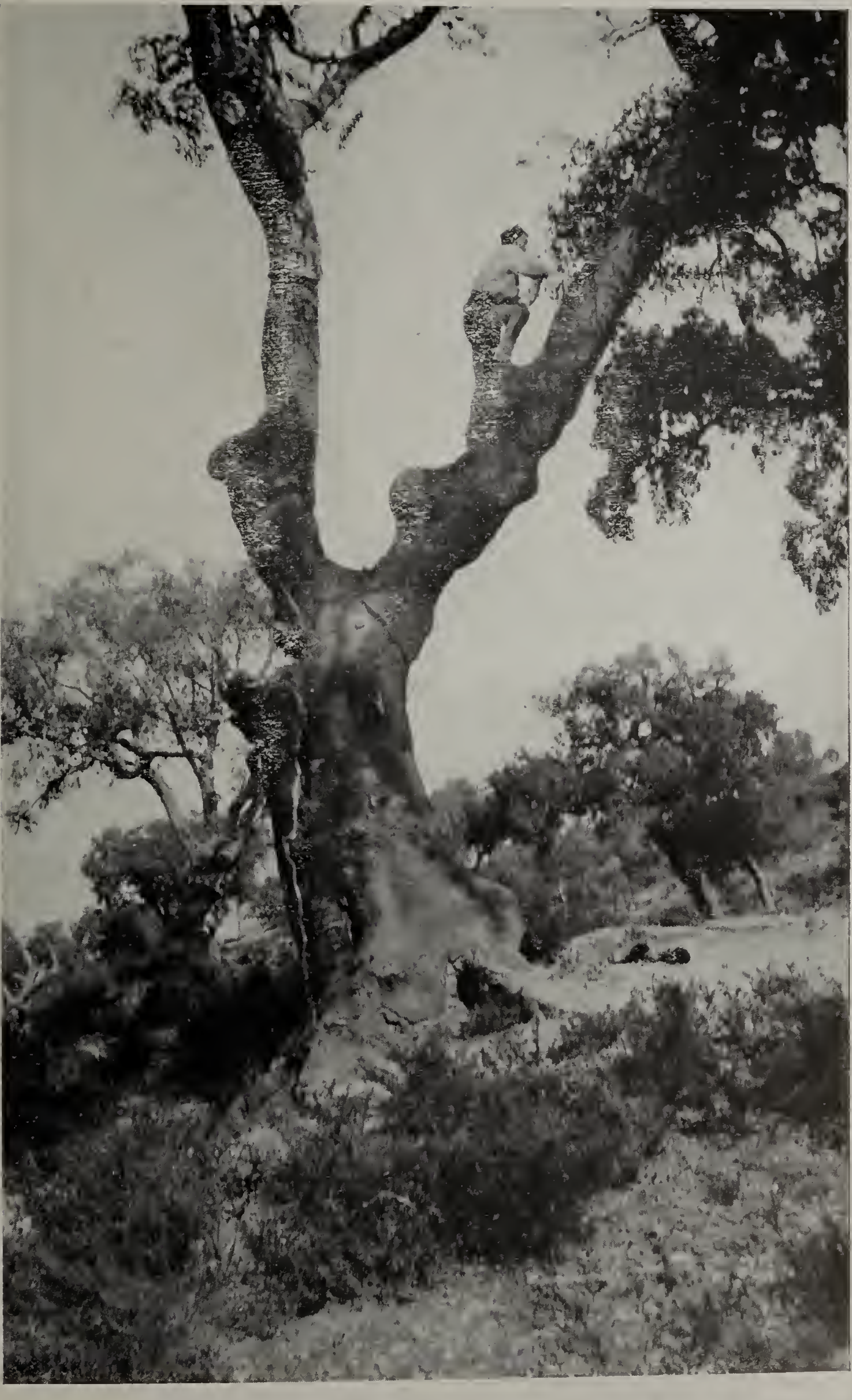

FIG. 1—Cork bark stripper at work. The unstripped portions of the bark may be seen on both branches above the level of the man's head.

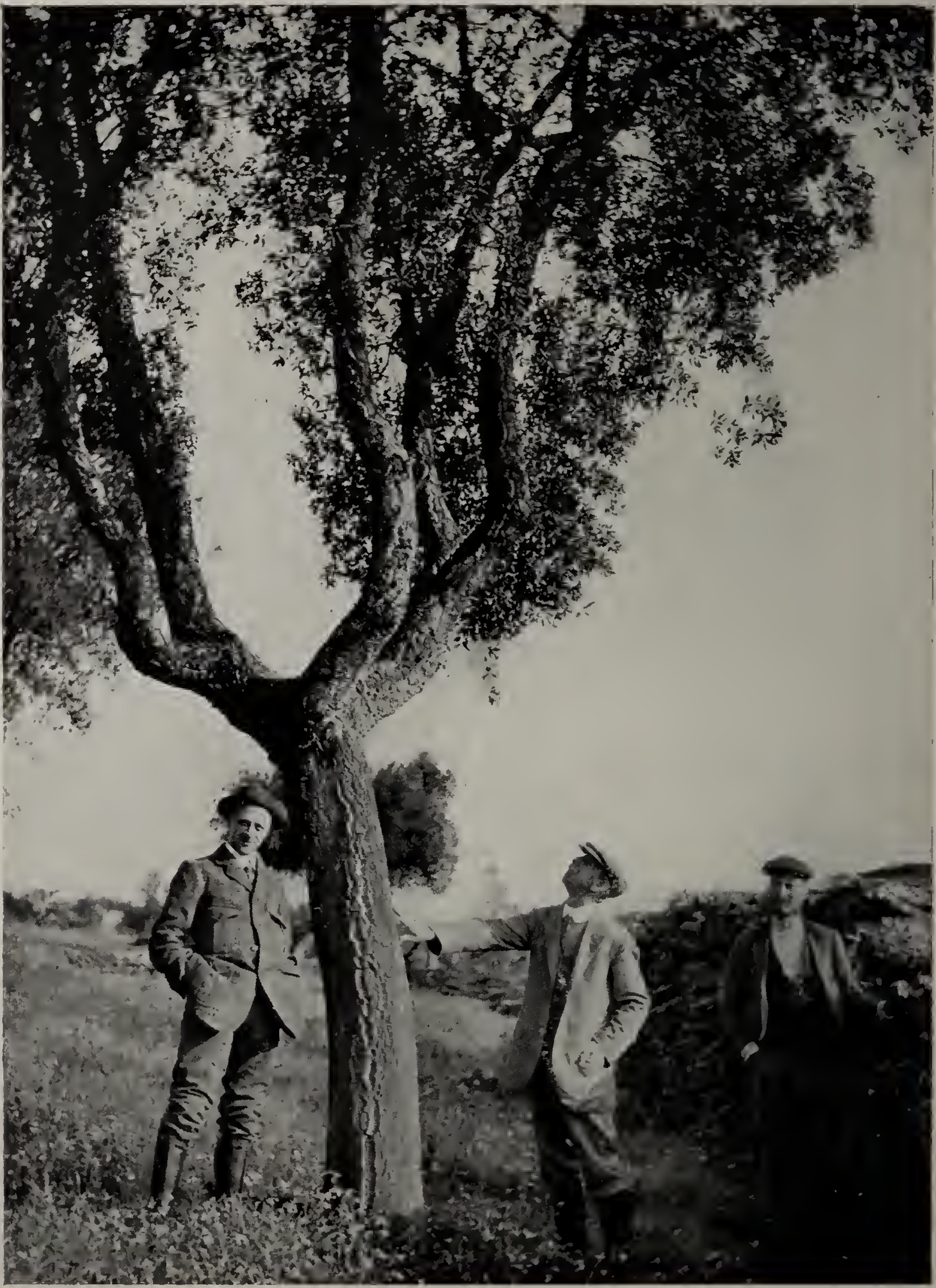

FIG. 2—Young cork-oak tree raising a second layer of cork. Branching limbs of the desired shape. The four limbs will produce more cork than the one trunk.

the would-be conservators have not had enough faith in this process of negation to mention it in connection with the greatest and most menacing of all resource wastes—soil erosion. This is the irreparable destruction, man's greatest crime against his environment. Most of the minerals can be substituted, and, as long as soil remains, the forests and fields can be restored, but where soil erosion does its deadly work, the possibility of forest production, and yet worse, the possibility of food production, is reduced or destroyed for an indefinite and often very long period—a geologic epoch, perhaps. Without a food supply an environment ceases to support man, despite the most wholesome and invigorating climate. The climate is then wasted. It is a fact rarely appreciated that some of the worst soil destruction now going on in the world is taking place in climates of high excellence right here in the United States. It is also probably true that this soil destruction is going on faster and also over larger areas than ever before in the world's history.[1]

As a means of getting more food and useful commodities out of the earth, with greater ease and with conservation of the soil, I here call attention to the idea of a new agriculture, a tree-crop agriculture, which seems to hold the promise of easily doubling our productive area and making revolutions in man's relation to his environment second only, perhaps, to the influence of steam. These new utilities arise from discoveries in economic botany which are hinted in the four words, *variation, heredity, propagation, culture.* If fruit and nut trees not yet recognized as crops in the United States equaled cement in the amount of study, exploration, and experiment bestowed upon them, tens of thousands of people would recognize at once that we have at our disposal a new means of utilizing the environment which would conserve it and at the same time double its capacity for supporting man, perhaps even with a diminution of effort.

In attempting to present the possibilities of such a new agriculture, such a new connection with the environment, I submit some data concerning the oak tree as a producer of crops other than wood.

I choose the oak deliberately because it seems to most people a peculiarly hopeless basis for an agricultural crop. We think of it as symbolizing strength, sturdiness, and the impossibly slow beginnings from that little acorn. This I believe is largely due to a concept that the poets have wrought into us. The oak trees should sue the poets for damages to a reputation that should otherwise be good.

The oak tree, without sacrificing a pound of wood, gives rise to one of the chief exports and two of the important industries of Portugal. If I wanted to be comfortably and permanently rich, I could ask for few more secure bases for it in the line of agricultural lands than the undisturbed possession of a few hundred acres of Portuguese land with a good stand of cork-oak trees (*Quercus suber*) and evergreen-oak trees (*Quercus ilex*). If the stand of trees was good, it would make little difference if the land happened to be rough, untillable hillsides. It would still yield its crops of cork and pork—the pork made of acorns. The virtues of the Portuguese cork forests are quadruple, and they are almost perpetual.

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[1] J. Russell Smith: Soil Erosion and Its Remedy by Terracing and Tree Planting, *Science*, Vol. 39, 1914, June 12, pp. 858-862.

With reasonable care, which consists of occasional cuttings-out of an undergrowth of bushes inedible to the goat, and occasional thinnings, the forest will live for centuries and yield four kinds of income. The trees yield best of both cork and acorns when the stand is not thick enough for the trees to crowd each other. This permits some growth of forage for sheep and goats. It is the common expectation that the income from this source in a proper oak forest will pay for the labor of grubbing bushes, which, aside from fire protection, is the only maintenance charge. That leaves the other three sources of income, wood, cork, and pork, to offset interest and taxes and make profit. The landlord's task is easy, as the pasture is rented by the tract, the cork is sold to contractors by the ton, the wood by the cubic meter, and the hog pasture on some lump arrangement.

Every nine or ten years the cork bark is stripped. An acre with a full stand of young trees will have seventy trees yielding fifteen kilograms per tree, or 2,300 pounds per acre. As the trees get older and are thinned out to prevent crowding, the increased yield per tree keeps the cork output up to the average which, with care, can be maintained at over a ton per acre indefinitely. Cork is now worth about seventy-five dollars per ton. When the trees come down, they make the precious charcoal by which the Portuguese nation shivers in winter while it cooks its simple meals. In the properly cared-for forest every old cork tree has beneath its branches several half-starved understudies leading a submerged life until it comes their turn to have space in which to spread. I have seen a large cork tree, fifteen feet in girth and with a reach of fifty-six feet, that had yielded 1,980 pounds of weighed cork at a stripping.[2] An acre will easily hold eleven such trees, and I am told by competent authority that there are many such acres in Portugal. It is an interesting and peculiar fact that the poorer the land the better the cork. This results from a finer texture due to slower growth and causes some fine cork forests to be on sandy or stony land, which in any other country would be called "barrens" and would find its highest productivity by growing a pine forest. In some districts the trees are made the sole basis of estimating the value of the land on which they stand. Near Evora, in south-central Portugal, the method of calculating the value of a cork forest is as follows. The twenty-year yield of cork (two strippings) is taken as the basis. The buyer pays 600 to 650 reis (1,000 reis=$1.08) per *arroba* (33 pounds) of cork capacity. Thus a good acre of cork trees would bring $125 or more, and the seller throws in the land.

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[2] Figures from a careful English owner with an engineer's training.

In America every teacher of economic geography is hammering into the heads of his students the relationship between the corn belt and meat production. If such a teacher should by any revolution in education get into Portugal, he would be emphasizing the relationship between cork and pork. English owners of cork estates in Portugal estimate that acorns alone produce from half to two-thirds of the total pork crop of that country. The Portuguese hog leads a lean and hungry life for a year and a half or two years, and then comes an orgy during which he eats acorns all day and sleeps on them at night. In three months he doubles or triples his weight and passes on to the ceremonies at the abattoir.

As the acorn crop is not under much control of man and does not come regularly, it is difficult to make an exact approximation of pigs and acorns. This difficulty is met by the organization of fortnightly markets in the villages of the cork regions where pigs in any and all stages of fatness and leanness are bought and sold at any and all times. Two weeks before the pig is completely fatted, he may be sold by the man who has a shortage of acorns to the man who has a surplus. Careful experiment in central Portugal has shown that 5.3 liters of acorns will make one pound of pork. By means of this Rosetta stone we can get some idea of the acorn yield, which in years of full crop is surprisingly heavy. In estimating the number of pigs to buy, the farmer walks through his forest scanning the trees and the acorns on the ground, and every time he sees the fattening for one more pig, he puts an acorn in his pocket. Such a man, a manager of an English-owned estate, has told me that big cork trees will yield 100, 200, 300, and even 400 kilograms of acorns, but not 500 kilograms.

On the unfenced acres of a cork estate two kinds of herders are daily abroad: the swineherd, whose wards eat grass and acorns, and the shepherd, whose sheep and goats browse the bushes and grass and furnish wool and milk, the fifth and sixth products of the cork forest.

As I rode through one of these estates on an April day, I came upon a long lane full of sheep, seven hundred of them, crowded solidly between close fences and two shepherds busy at their regular afternoon job of milking them. They started at one end of the long and motley mass and worked their way through it. One presided over the milk bucket, the other caught the ewes, backed them up to the bucket, and held them for the milker to extract a few spoonfuls of rich milk, after which the poor beasts were pushed aside to join the growing mass of the recently milked. That evening at the house of João Dias, estate foreman, I had for supper rich cheese of sheep's milk, but my appetite for it was not increased by the memory of the first process of its making.

The evergreen-oak (*Quercus ilex*) has bark of no value, but is a greater yielder of acorns than is the cork-oak, so that no Portuguese will cut down the one tree for the other, so absolutely are they valued alike. Often the two species are mixed indiscriminately in the same tract, but in some

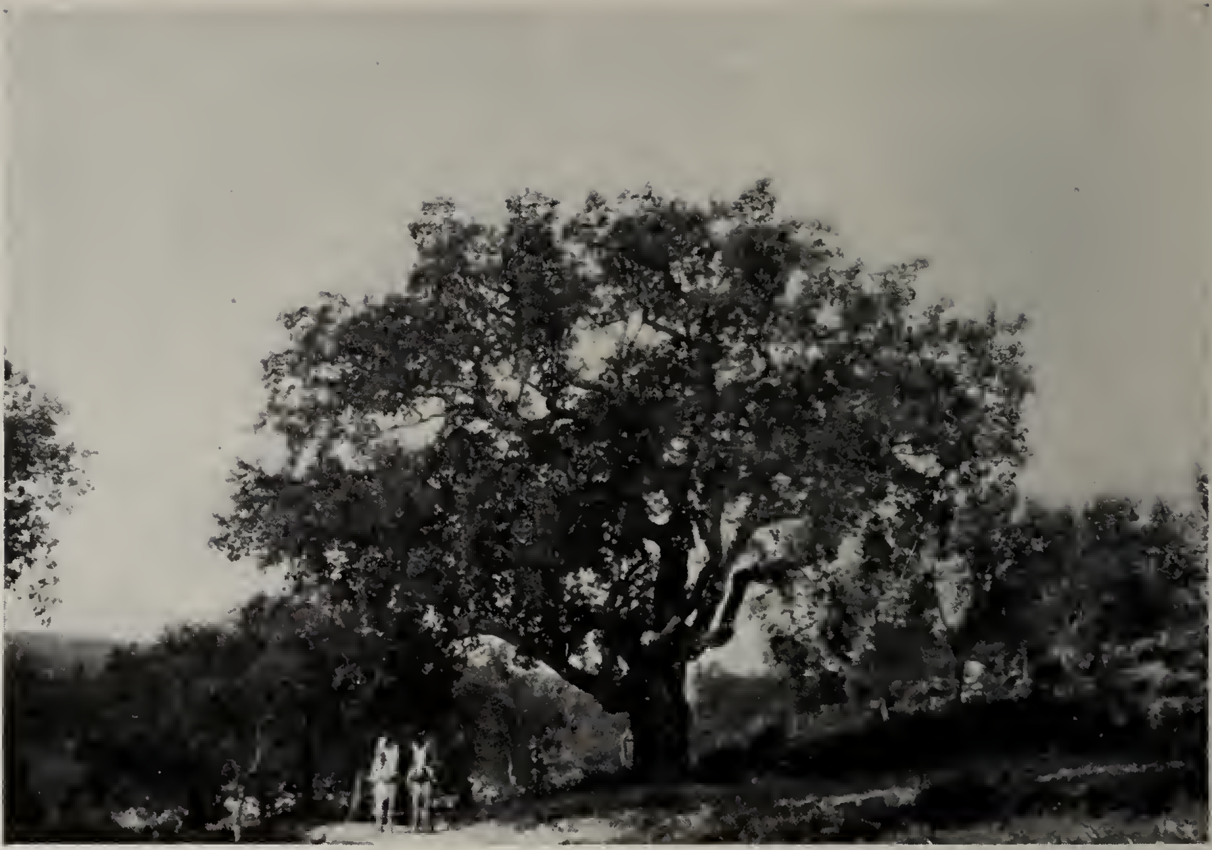

FIG. 3.

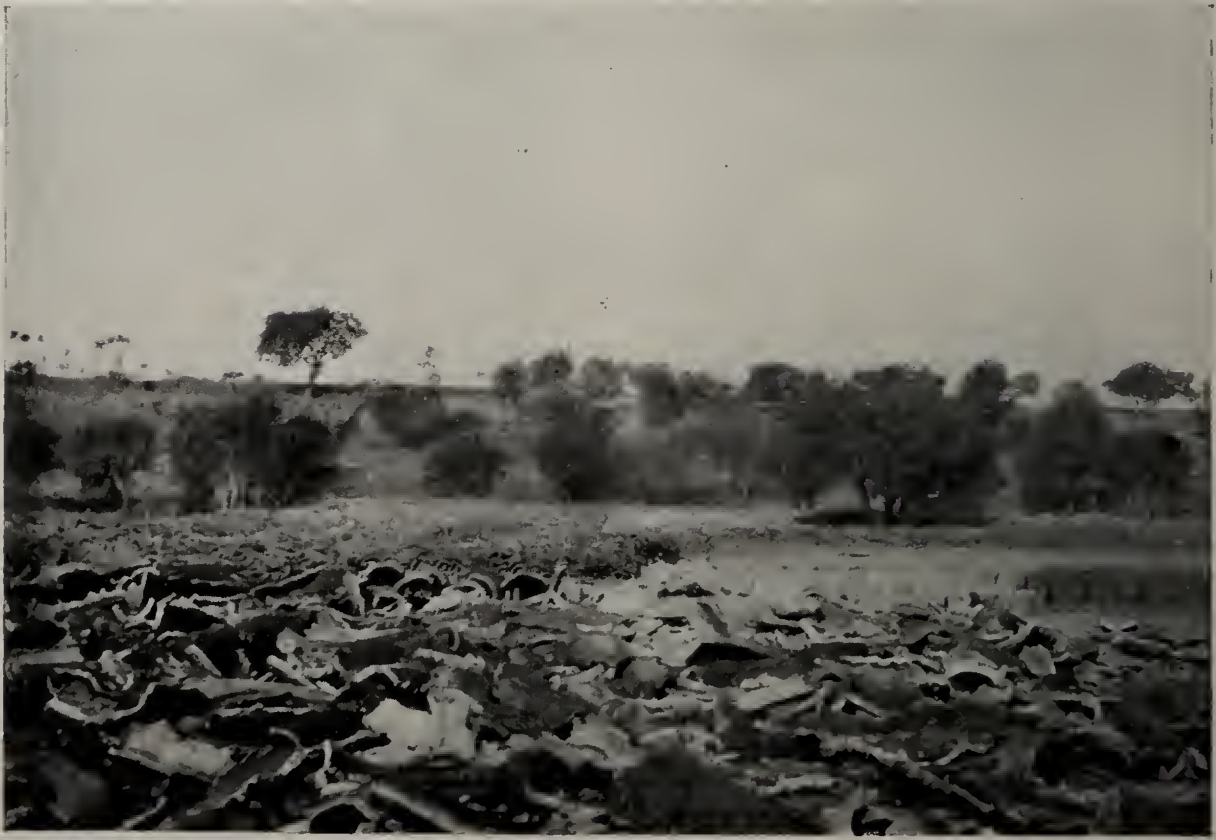

FIG. 4.

FIG. 3—Cork tree with a weight record of 1,980 pounds of cork at one stripping.

FIG. 4—Piles of crude cork awaiting shipment at railroad station, central Portugal. Cork trees in the background.

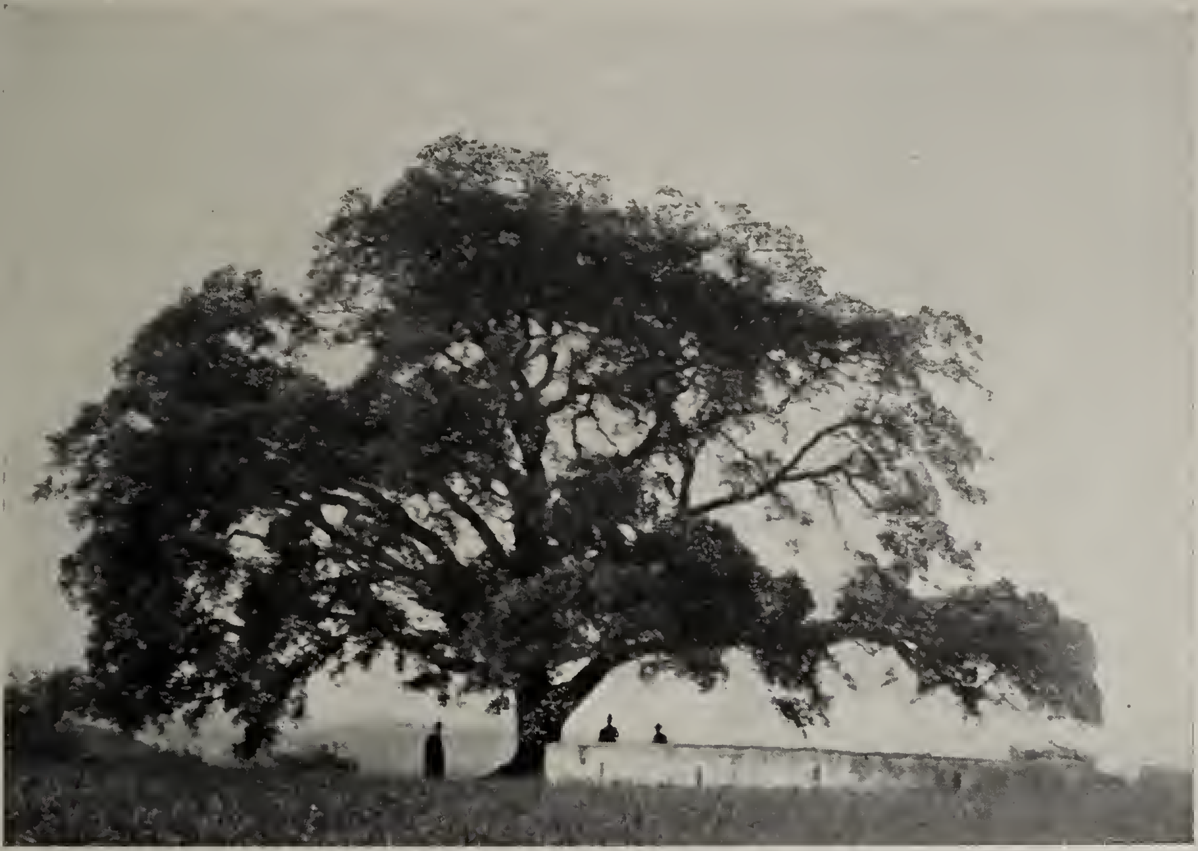

FIG. 5.

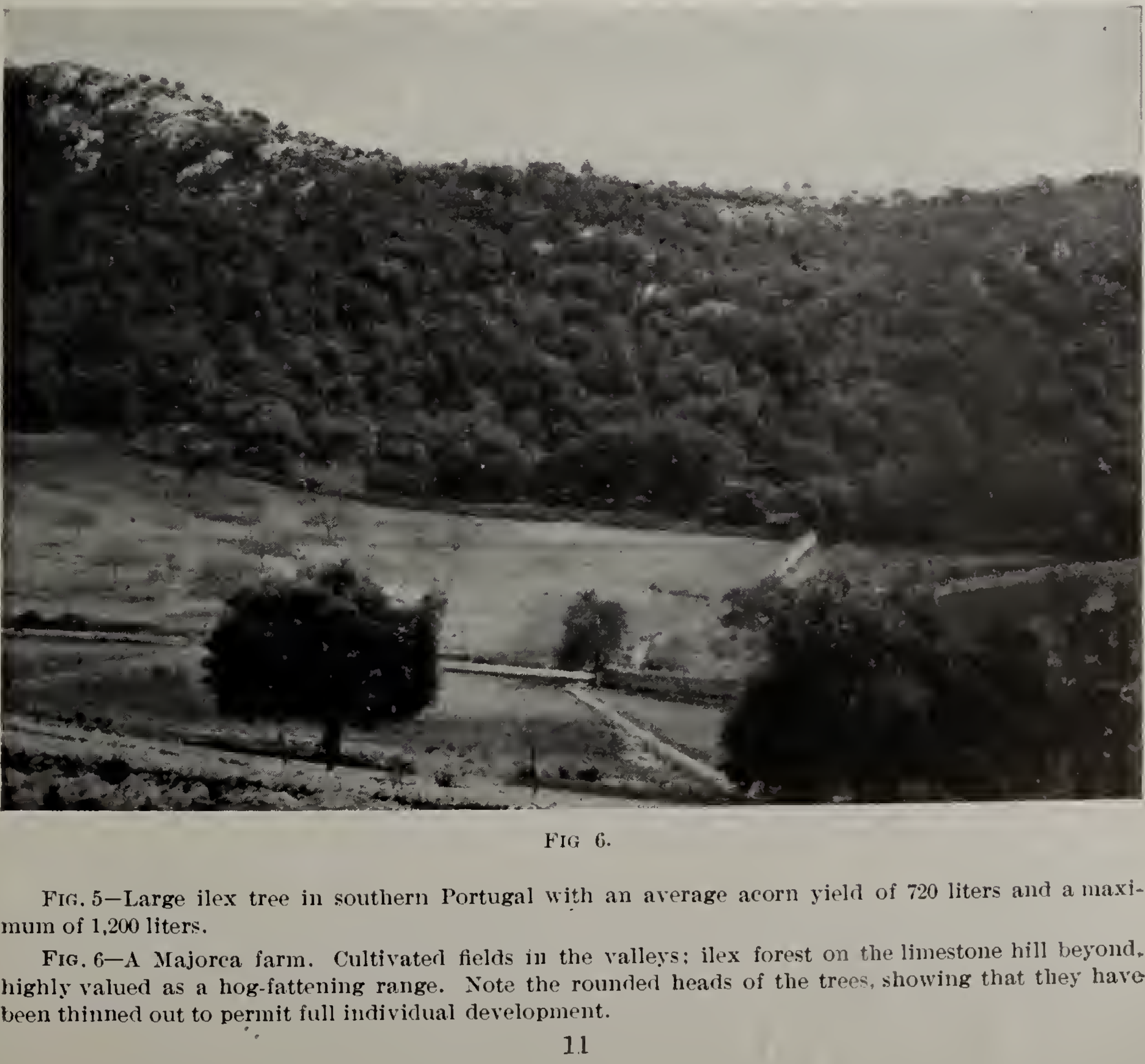

FIG 6.

FIG. 5—Large ilex tree in southern Portugal with an average acorn yield of 720 liters and a maximum of 1,200 liters.

FIG. 6—A Majorca farm. Cultivated fields in the valleys; ilex forest on the limestone hill beyond, highly valued as a hog-fattening range. Note the rounded heads of the trees, showing that they have been thinned out to permit full individual development.

localities the ilex forests are almost pure stand and are cared for exactly as are the cork forests. In other localities the young trees are allowed to grow where they spring up by chance in the fields, and the ordinary cultivation of wheat and beans, barley and hay, goes on just the same. This gives a beautiful parklike landscape; the cultivation helps the oaks to make acorns; and after the grain crops are harvested, the hogs are turned in to gather the mast crop.

Reliable records of measured yield of anything are hard to secure in such a land of hit-or-miss as Portugal, where the average farmer does not know even the size of his farm. He often buys it or rents it by the unmeasured piece, as we do horses. The difficulty of getting records of yields of oak trees is further increased by the practice of letting the animals do the harvesting. But down in Algarve, the southernmost province of Portugal, I heard of an ilex that bore 1,200 liters of acorns. The definiteness was pleasing to the ear of one in search of facts, and the size of the yield was surprising. I went to see the tree, which had a reach of only fifty-one feet. By long and devious methods I cross-questioned the owner, a widow of sixty, more or less, but she always struck to it that the tree bore 1,200 liters on full years and 240 liters in the alternate years, and that the average was 720 liters per year. She said she knew, because she picked them up and sold them in the village. Selling acorns is a common but not extensive practice in many parts of Spain and Portugal, and this woman's tree stood alone in an unfenced outer yard at the edge of the village of St. Bras, so that it was not convenient to let pigs do the work of harvesting. Everybody around believed the woman's statements, a process which is made easier for us in this country by the statement in the September, 1915, number of the *Journal of Heredity* that a certain valley oak tree in California bears a ton of acorns as a full crop. (The average yield of corn per acre in the United States is about 1,400 pounds, or 800 quarts.)

On the slopes of the Sierra Nevada in Spain, a few miles south of Granada, I saw the ilex rendering its supreme service—holding the earth for man and at the same time giving him a living. In this locality the formation was unconsolidated clay and gravels of such depth that no bed rock was anywhere in sight. The slopes and height were such that the name mountain would be applied perhaps even by the Swiss. On one of these slopes I examined an ilex orchard that was giving a fair return as part of a farm. A part of this orchard was so steep as to be very difficult of ascent. When the tenant told me he let his hogs run there, I asked him how he kept them from falling out into the stream below. "Oh," he said, "I don't let the big fat ones come here. I'm afraid they would fall. I only bring the little ones into this part." A mile away, on a less steep part of the same slope, men for centuries had been supporting themselves by the agriculture of the plow, and nature had shown her resentment of this act of violence. In some places from half to three-fourths of the original land surface was gone, through the work of gullies that were from fifty to two hundred feet deep. ''After man the desert'' was here literally being put into effect. The ilex slope was much the more productive of the two, and it had been saved by being so steep that it could tempt no plowman.

In Corsica, where a very systematic and effective tree-crop agriculture has been worked out with the productive grafted chestnut tree as the main dependence, the ilex is a secondary crop of no mean importance, although, for some unaccountable reason, the people have not improved it by grafting as they have done in the case of the chestnut. This oak will grow at greater altitudes than the chestnut, and it spreads out in a far-reaching zone on the higher slopes above the chestnut forests. Here, as in Iberia, acorns are used for fattening swine and goats.

It is in the Balearic isle of Majorca that we see indications of the highest possibility of the acorn, namely, its service as food for civilized man. The acorn analyzes well, being nearly as nutritious as maize, except for a part of the protein content. This highly starchy nut—for it is a nut—is mostly too bitter to be relished as human food, because there is a certain amount of tannin present, but, owing to the ever-present variations of individual trees, there are some ilexes that bear acorns as much prized for human food as are chestnuts. Twigs from some of these choice trees have, for a century or two, been grafted upon the common kinds in a few localities of Majorca and the Spanish mainland, and the fruit is sold in competition with and at the same price as the chestnut. Why has this not become an extensive industry? That question can only be answered by asking others. Why have not the people of the United States copied the Corsicans, French, and Italians in developing orchards of improved chestnuts on our own steep and rocky slopes where the wild chestnut tree has been ready for grafting ever since the first settlers landed?

The acorn, despite its bitter flavor, has served and yet serves as an important food supply for many isolated primitive peoples, especially in years of poor harvest of their tilled crops. Examples of this are found among the Berbers of the Atlas and the Indians of Nevada and California. Ethnologists could doubtless multiply examples by the score, and it has almost certainly been one of the important foods of primitive and prehistoric man in the oak-growing regions which nearly encircle the earth in the north temperate zone. The low protein content of the acorn makes it an admirable food to balance the meaty ration of a hunting tribe. Mr. George B. Sudworth, dendrologist of the U. S. Forest Service, reports that an Indian tribe in Nevada makes an annual autumn excursion over the Sierra into California. There they busy themselves in the national forests gathering acorns and carrying them out to the trails in sacks. Thence they are packed or hauled over the mountains to the tribal home, and the bread supply for a year is secure. It is a part of the squaws' regular

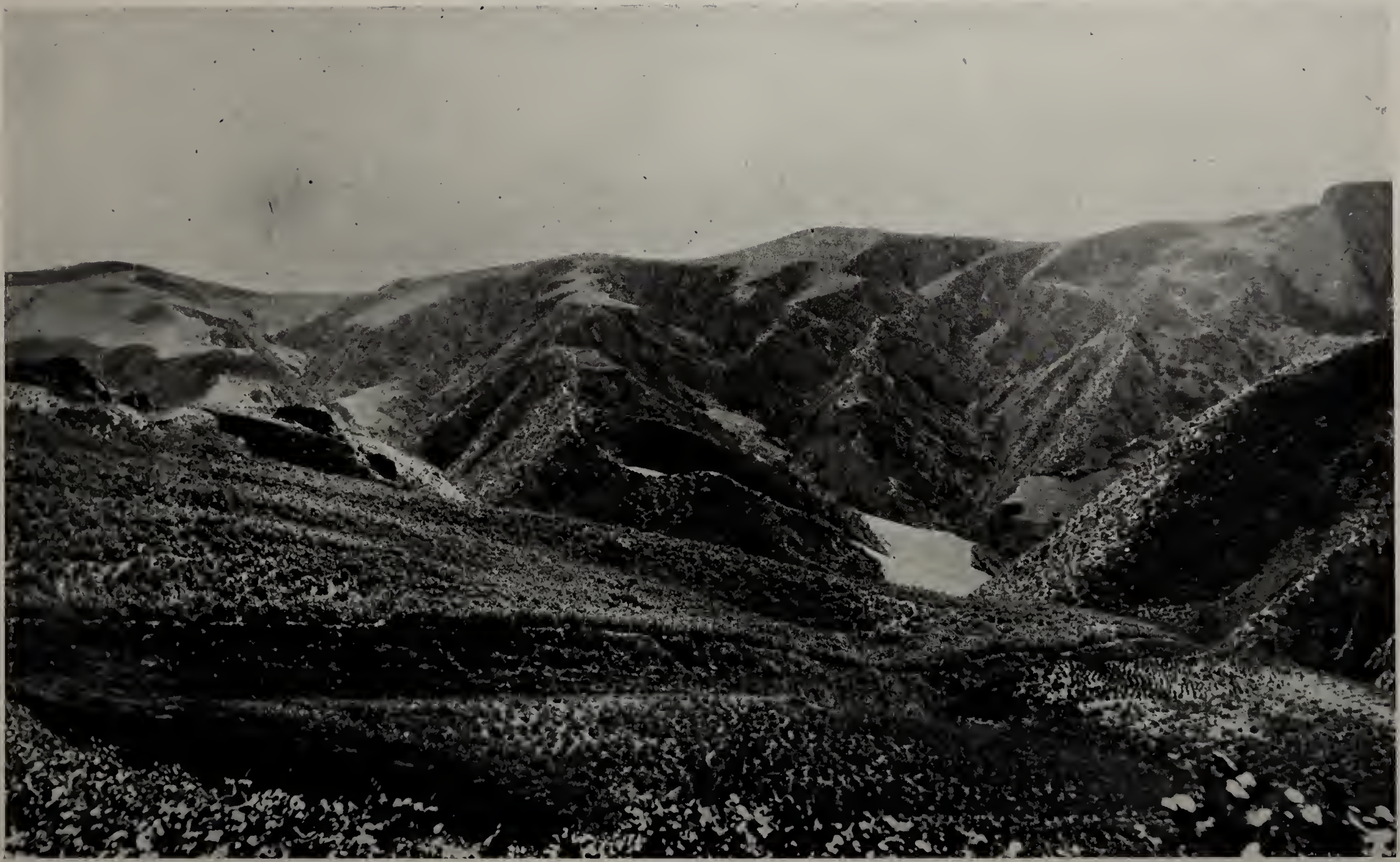

FIG. 7—Effect of soil erosion in the border region of the Sierra Nevada near Granada, Spain. The ridge in the background has been ruined by erosion, which has

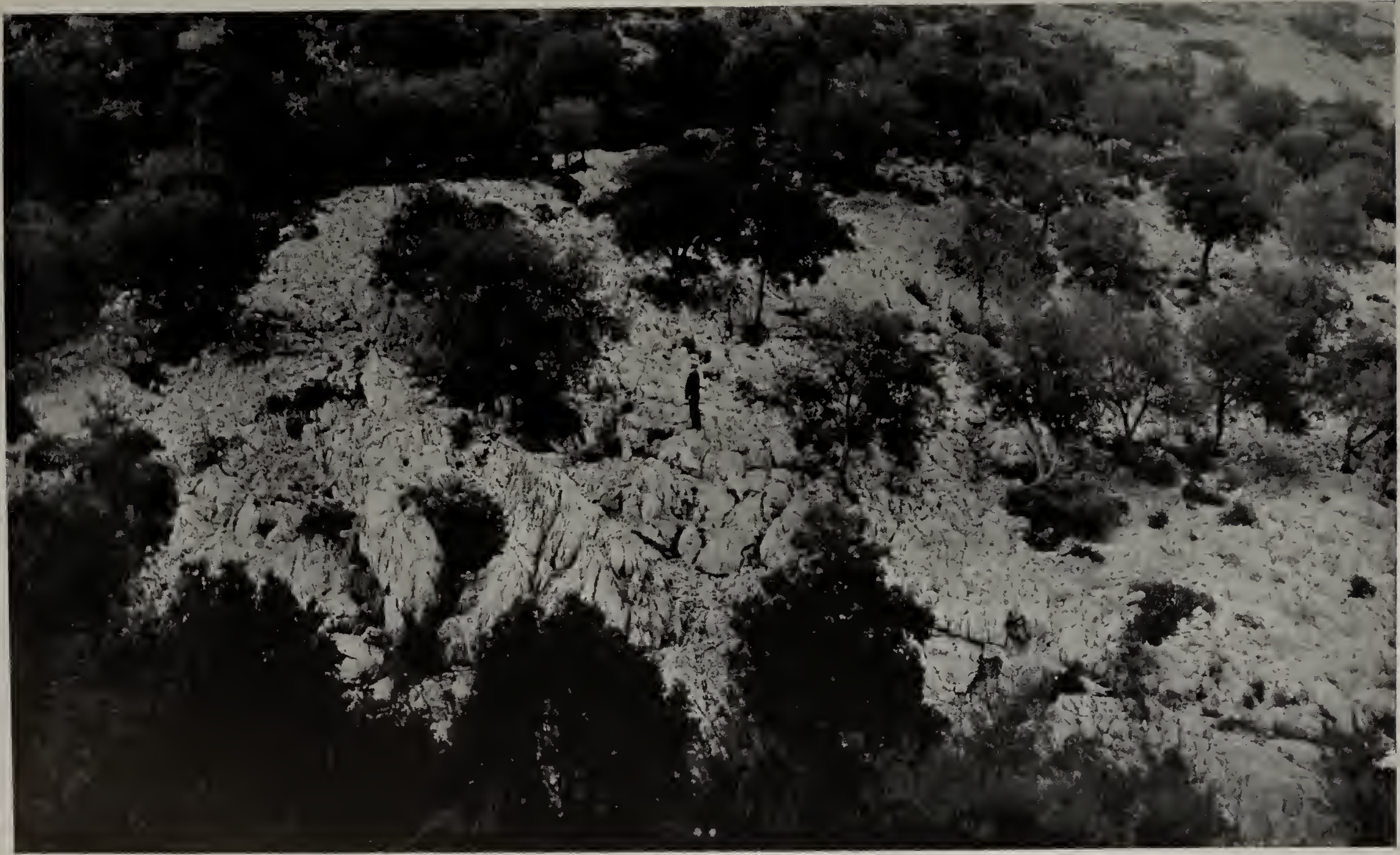

FIG. 8—Hillside of limestone in Majorca. Ilex trees wedging themselves into the crevices of the rock and yielding a crop.

routine daily to pound up a portion of acorn meat and soak it in water that the tannin may be dissolved and the bitter meal made sweet. The coarse, wet farinaceous mass that remains is the oatmeal, shredded wheat biscuit, corn meal mush, pone, or wheat flour for the tribe. I should be much interested to know what a good industrial chemist could do with that liquor containing the tannin extract, for tannin is scarce. And I have great faith that in this day of blended foods the Bureau of Chemistry at Washington might, with some mixture of grains, sugars, and starches, produce an excellent food like shredded wheat or crackers which could have acorns as its base, be made in a factory, and keep for weeks or months.

In speaking of the possibility of the acorn as human food, I wish to emphasize the fact that I am pointing out possibilities only. Man likes to eat what he likes, and he is very conservative about making changes. Serious consideration of the acorn as an American crop should be along the lines of its real importance in Europe—forage. Our rising price of meat indicates a shortage of forage, a shortage which promises to grow keener as population increases faster than fields. It is rarely appreciated that something like nine-tenths of the produce of American agriculture goes to feed our animals. There is the constant menace of over-production in many of the crops that man himself eats directly, but for forage, for animal food, which may give us cheaper meat, more leather and wool, there is almost indefinite room for expansion.

Even America is not without suggestive beginnings in the use of the oak tree. The U. S. Forest Service annually admits two hundred thousand or more swine to the national forests for a consideration. The acorn is one of the chief reasons why the owners of these animals pay for their admission to the forests. This practice is almost the exact duplicate of the way it is done in Spain and Portugal. I have found a farmer in the coastal plain of Georgia who thinks that his plantings of the water-oak are making more hog food with its acorns than corn would yield on the same poor sandy soil. I have found another experimenter on the clay hills of the Georgia highlands who thinks the chestnut-oak one of the most promising forage plants for large areas of Appalachia. At Hubert, Minnesota, Colonel Freeman Thorpe, a private investigator with faith in trees, has become convinced by his experiments that the Minnesota black-oak can be made to yield a hundred bushels of acorns per year on soil that will not make one-third that much corn.

This accumulation of experience of the Old World and the New World seems to show beyond peradventure that the oak genus with its many fruitful species is worthy of careful investigation by agricultural science. The case seems almost analogous to the first discovery of reinforcing in concrete and its relation to engineering science.

What is agricultural science to do with the oak tree? Four things may

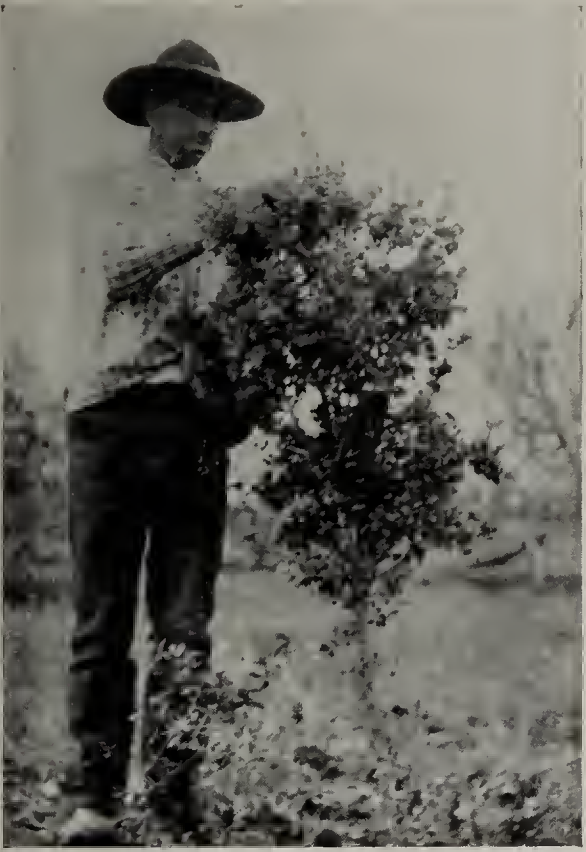

FIG. 9.

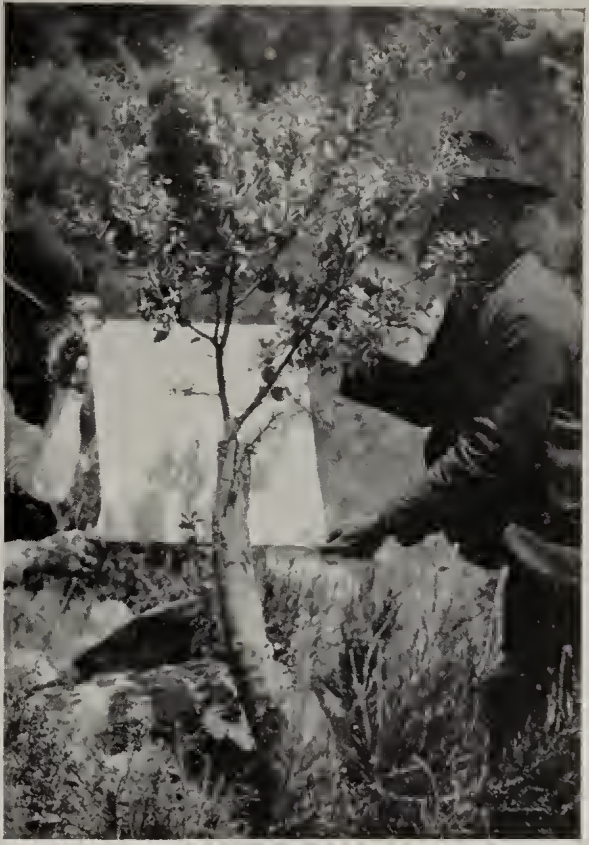

FIG. 10.

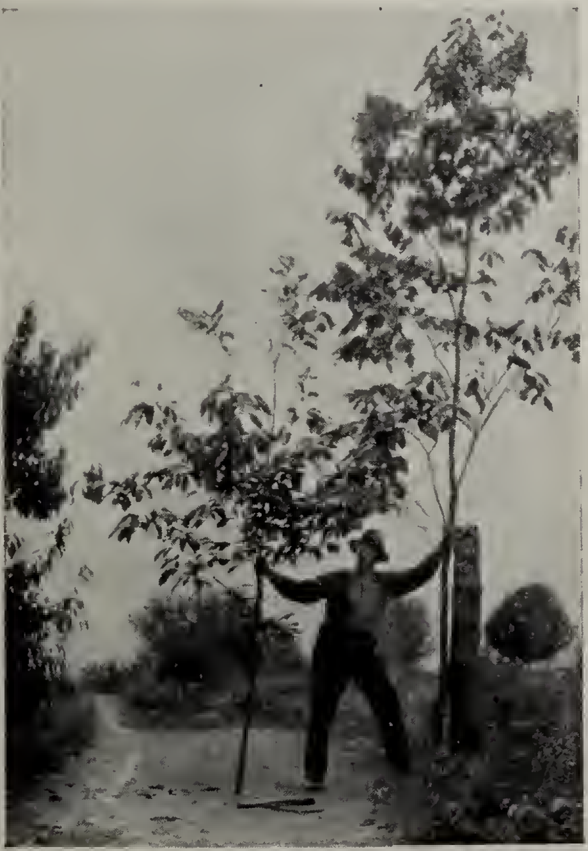

FIG. 11.

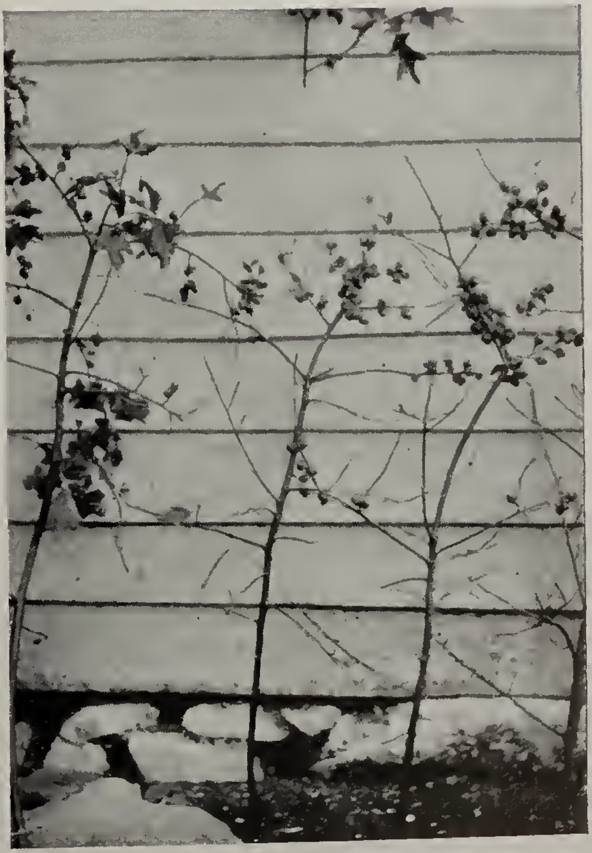

FIG. 12.

FIG. 9—Young ilex tree, central Portugal, in full bloom. Peasant by it declared it bore "about two hundred acorns the preceding season."

FIG. 10—Young grafted ilex tree in Majorca, Balearic Islands.

FIG. 11—Chestnut-oak trees grown from shoots around stump of trees that had been cut seven years previously on the Blue Ridge in northern Virginia. Both trees are bearing acorns.

FIG. 12.—Turkey-oak photographed thirty months after desolation by forest fire on the quartz sandstone soil on top of the Blue Ridge in northern Virginia. The boards in the background are five inches wide.

be done: (1) find the best wild parent trees; (2) propagate them; (3) breed better types; (4) propagate these better types.

The fact of individual variation of specimens has given us the Baldwin apple and the sour roadside crab, both of which are of the same species as recognized by botanists. The first Baldwin apple-tree was a Napoleon among trees which happened to be caught and propagated by the million.

This variation of individuals extends also to the question of precocity, a respect in which the oak trees as a class suffer unjustly in men's minds, as was mentioned above. In Portugal, Spain, Algeria, and Tunis, I have seen hundreds of ilexes not as high as my head, in full bloom. I have been repeatedly assured that they bear profusely at such small sizes and at an age not exceeding that at which the apple commonly begins to bear. But we have more remarkable oak trees in the United States. The crests of many Appalachian ridges are made by a stratum of Cambrian sandstone or quartzite in which grains of sand, held together by a silicious binder, break up slowly into a sandy soil of most pronounced sterility. Where its physical conditions would permit agriculture man shuns this soil as he would the Sahara. Yet several species of dwarf oaks grow in this forbidding ground. One of them is reported by Dr. Charles S. Sargent to lie over on the ground, so great is the burden of its acorn crop. In the Maryland, Virginia, and West Virginia section there is a low-growing species, having fruit within two feet of the ground, called the turkey-oak for obvious reasons. On one particular stretch of the above-described quartzite soil that has come under my observation, there has been a forest fire every two or three years for the last forty years at least. In April, 1910, I saw one of these fires, which burned everything to the ground. Thirty months later the turkey oaks were thirty inches high and full of fruit. Such quick and continued fruitfulness from such sterility seems little short of miraculous and certainly shows a combination of qualities that man should make efforts to put to economic use. Chestnut-oaks growing on another soil type a half mile distant from the above-mentioned turkey-oaks have produced seed the seventh summer after the shoots sprang up from stumps left by the lumbermen. In the case of these chestnut- and turkey-oaks there was no especial search made for extra specimens. They merely grew by the roadside along which I had to pass. Hybridizing of these species to get the best blend or mixture of their qualities offers an enticing field to the experimenter.

The breeding of plants for definite ends has just begun. It offers great and as yet little-appreciated possibilities. There is small reason to doubt that breeding experiments in the oak genus will permit the essential duplication of the results obtained by Dr. Walter Van Fleet of the U. S. Department of Agriculture with the chestnut. This tree often bears only at an advanced age, but by taking advantage of the precocity of rare individuals

Dr. Van Fleet was able to produce specimens so precocious that they bore eighteen months after the seed was planted.

The producing of better strains by crossing and hybridizing is usually a slow and somewhat difficult scientific process. In any case it should follow a careful search of existing trees so that it may start with the best raw materials. In the meantime many of these naturally produced trees are well worth propagation if they can just be sought out. Let us hope that the economic botanists and the agricultural scientists will soon be able to address themselves to this task.

The oak with its many species, one or more of which cover nearly all sections of the United States, is merely a type. In some sections there are several trees which may by selection, propagation, and hybridization become the vehicles of crops, the basis of a new agriculture.

In the past, agriculture has depended on the plow. If land was not arable, it was not fit for agriculture. The experience of many Mediterranean localities and the evident possibilities of tree crops show that we have at hand the materials for a new tree-crop agriculture that may more than double the productive area of many hilly, stony, and mountainous districts. Such a development promises to bring new and interesting influences to bear upon the wood supply, soil erosion, stream control, and the water supply, all of which are major problems in man's utilization of the environment.

FAULT COASTS IN NEW ZEALAND

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Introduction

The scientific study of scenery has engaged the interest of geographers ever since the time that explanation began to supplement mere description. There is an infinite variety of landscapes, and among them are types that make their sentimental or intellectual appeal to this class or to that. The stern shores of the fiorded Alaskan coast and the bitter walls of rock that meet the Atlantic in western Scotland are a challenge to the imagination of even primitive men. To the philosophic student of modern times they appeal to the investigating sense no less than to the emotions. The finer shades of appreciation find an ample field in the delicate beauty of terraced coasts or the tree-fringed islets of tropical seas. Yet here, as on the bolder coasts of the world, man's sense of how and why is stirred to action. Thus there has arisen a phase of physiography that deals with the shore, with its multiplicity of forces, and its infinite and inspiring detail.

The topography of continental interiors represents chiefly the reaction between air and water on the one hand and the crust of the earth on the other. The topography of the shore is vastly more complex. A third agent, the sea, plays its varied rôle upon a surface already complicated by subaërial agents. When to this diversifying agent there is added crustal fracturing of unlike kind in unlike amounts, and all the irregularities of form produced by crustal warping, the result is likely to be a problem of the first rank. Moreover, the shore-line runs its cycle of change in obedience to laws and at a rate wholly unlike those that affect the interior of the land. At any stage in the normal cycle of the land the sea-shore may have reached a wholly different stage in its development. In the inharmonious relations of these forces lie half the physiographic problems of the coast.

To put into an orderly scheme so complex a set of agents and forms as the coast lines of the earth display, the great masters, Suess and Richthofen, each attempted to classify the various coastal forms by groups, and each believed that he recognized a group in which crustal fractures determined the position of the shore-lines. Thus we have the "Atlantic" coasts of Suess and the *Beckenrandküsten* of Richthofen. Suess defines the Atlantic type as follows: "The inner sides of folded ranges, jagged rias coasts which indicate the subsidence of mountain chains, fractured margins of horsts, and fractured table-land form the diversified boundary of the Atlantic Ocean.''[1] Richthofen's *Beckenrandküsten* are formed by the walls of basins due to foundering on the inner side of mountain ranges. It is interesting to note that Richthofen regarded the east coast of New Zealand as of this type and considered it exceptional in that it faced the open ocean.[2]

These classifications of coast type are based upon the broad structural features of the adjacent lands. In framing them their authors, particularly Suess, paid little attention to the actual features of shore-lines, to the topographic forms of coastal lands, or to the configuration of neighboring sea floors, any or all of which may throw light on the origin of a coast.

In a recent European classification of coasts, that of De Martonne, we find *côtes des régions d'effondrement* with initial forms determined entirely by fractures. As examples are cited the coasts of Greece, southern Italy, and Japan.[3]

Turning next, however, to the writings of geomorphologists of the American school, we find that fault coasts are not recognized by them. Gulliver[4], for example, has distinguished as initial forms of shore-lines those resulting from ''uniform uplift,'' ''uniform depression,'' and ''diverse movements,'' and among the last he has mentioned ''crumpling and faulting''; but, in the study of sequential forms, he has not recognized any features as characteristic of shore-lines the initial forms of which were fault scarps. The omission was, no doubt, due to the circumstance that, in the material available for study, coasts that had previously been regarded as fault coasts, e. g., some of the Atlantic coasts of Suess, found a more acceptable explanation as sequential forms developed from initially depressed, uplifted, warped, or tilted coasts.

The writer therefore deems it advisable to sketch briefly a scheme of forms which fault coasts may be expected to exhibit, before setting out his reasons for believing that certain of the coasts of New Zealand are of this kind. A complete scheme would be too long for presentation, and so only such portions of a complete scheme will be given as seem applicable to those coasts which the writer has had the opportunity of examining.

THE FAULT-COAST HYPOTHESIS

INITIAL FORMS

The essential feature of a fault coast is a fault scarp separating a higher-standing earth-block, which, after faulting, forms the land, from a lower-lying block, which, after faulting, is depressed below sea-level. The pre-faulting surface may have any form. It may be a level sea-floor, or it may be a land surface with low, moderate, or strong relief. The vertical displacement on the fault may be small or great if the pre-faulting surface has low relief, but, if the pre-faulting surface has strong relief, a continuous fault coast can be formed only by a vertical movement of hundreds, perhaps thousands, of feet; that is to say, the movement must be sufficient to submerge the ridges of the down-thrown block. Incomplete submergence would result in the formation of outlying islands, peninsulas, and promontories, as partially drowned ridges would project seaward from the fault line (Fig. 1).

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[1] E. Suess: The Face of the Earth (Engl. transl.), Vol. 2, Oxford, 1906, p. 203.

[2] F. von Richthofen: Führer für Forschungsreisende, Hanover, 1886, p. 300.

[3] E. de Martonne: Traité de Géographie physique, 2d edit., Paris, 1913, p. 712.

[4] F. P. Gulliver: Shoreline Topography, *Proc. Amer. Acad. Arts and Sci.*, Vol. 34, 1899, pp. 151-258.

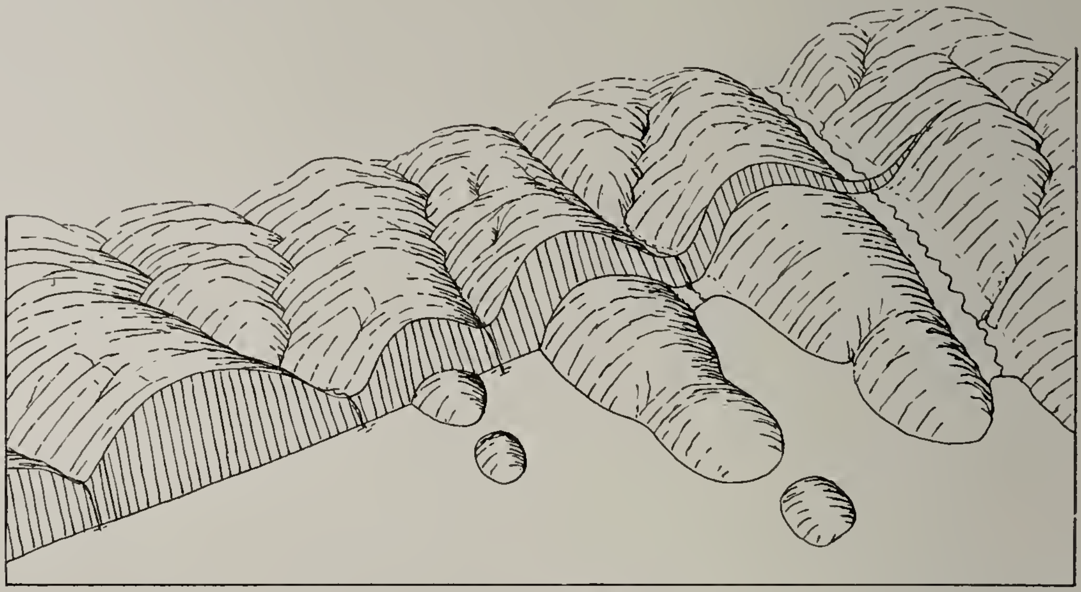

Fig. 1—A fault coast (on the left) formed by a fault scarp diminishing in height towards the right, where islands and promontories make their appearance seaward of the scarp and the fault dies out inland.

The movement of the earth-block is relative movement, and so various cases arise, according as the landward block has been uplifted, has remained stationary, or, if the region was formerly above sea-level, has subsided with, though to a smaller extent than, the seaward block. It is thus possible to imagine many variants of the initial form. A transition may be traced, for example, from a normal fault coast through a case in which the pre-faulting surface has no relief, with diminishing and finally vanishing displacement on the fault, to a normal uplifted coast (Fig. 2).

A transition in the other direction may be traced through a case in which the pre-faulting surface is an accidented land surface, with increasing depression of the landward block, to a normal depressed coast (Fig. 3).

In order to simplify this discussion, attention may be directed principally to those cases in which the pre-faulting surface is a land surface of moderate to strong relief, in which the seaward block is completely submerged, and in which the displacement on the fault is considerable. Imagined initial fault coasts, thus limited, fall into two groups. The first includes those during the formation of which the landward block rises or remains stationary (Fig. 4, block *A*). In either of these cases the shore will be formed by a continuous fault scarp differing from the initial form of a fault scarp on a land surface in no respect except that the base of the visible portion will be the horizontal sea-margin. All along the coast betrunked streams will cascade into the sea from the mouths of hanging valleys. Fault coasts of a second kind may be formed if a movement of subsidence in the landward block accompanies faulting (Fig. 4, block *B*).

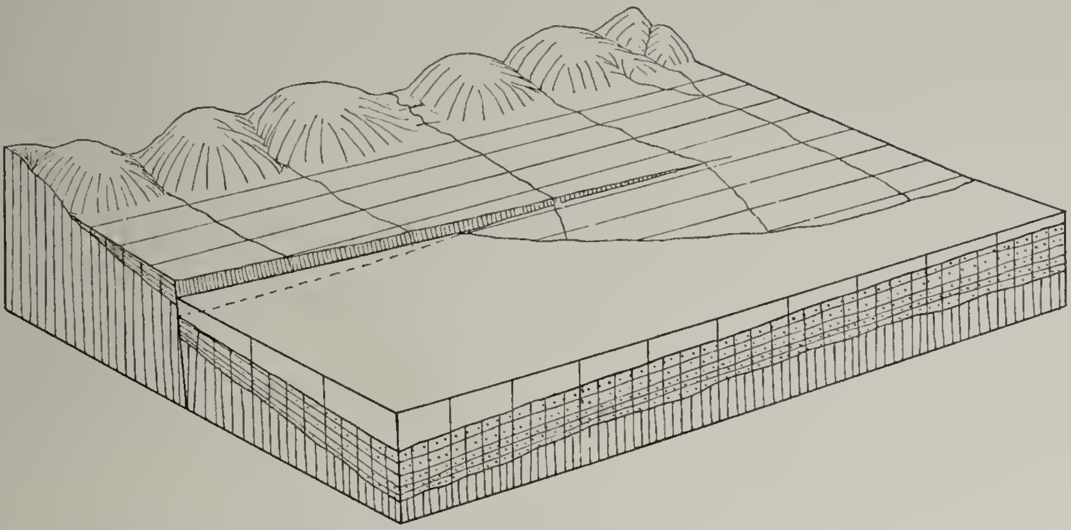

Fig. 2—A fault coast, on the left, formed by a fault scarp diminishing in height and dying out towards the right, where the coast passes into a normal uplifted coast.

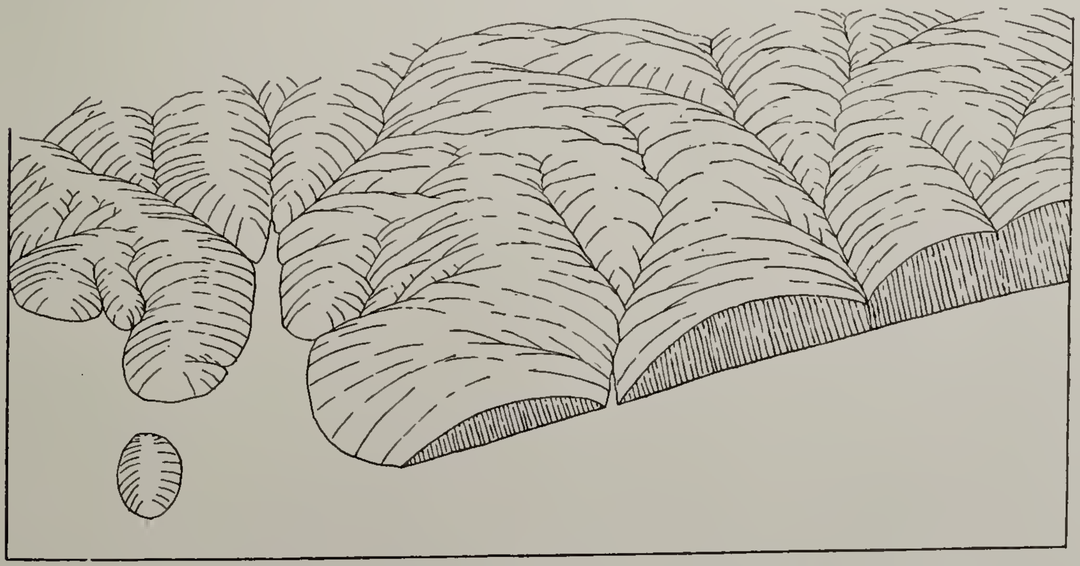

Fig. 3—On the right a fault coast, which, owing to downward tilting of the landward block toward the left, passes into a normal depressed coast on the left.

If the subsidence is sufficiently great, the deeper valleys of the pre-faulting surface will be drowned and the initial shore-line will therefore be less simple than in the preceding case, as there will be a few reëntrants breaking the simple line of the fault coast. In order to simplify the discussion as far as possible, it is assumed that the seaward block sinks to such a depth that the underwater portion of the fault scarp forming the initial coast descends everywhere into deep water (to a depth of 600 feet or more). Seaward, the sea-floor will have, initially, the relief of the submerged land surface, while, close inshore, the initial floor will slope steeply seaward, being formed by the fault scarp itself if the fault hades seaward at a considerable angle, or, if the fault is nearly vertical or overhangs, by a talus of waste that has broken away from the crest of the landward block while the faulting movement was in progress. (For convenience it is assumed that the work of erosion is not begun until the earth movements that produce the initial form are at an end. In nature erosion is never thus delayed, but the writer believes that the sequential forms of fault coasts may be most satisfactorily deduced with this assumption and that the errors resulting from it are very slight.)

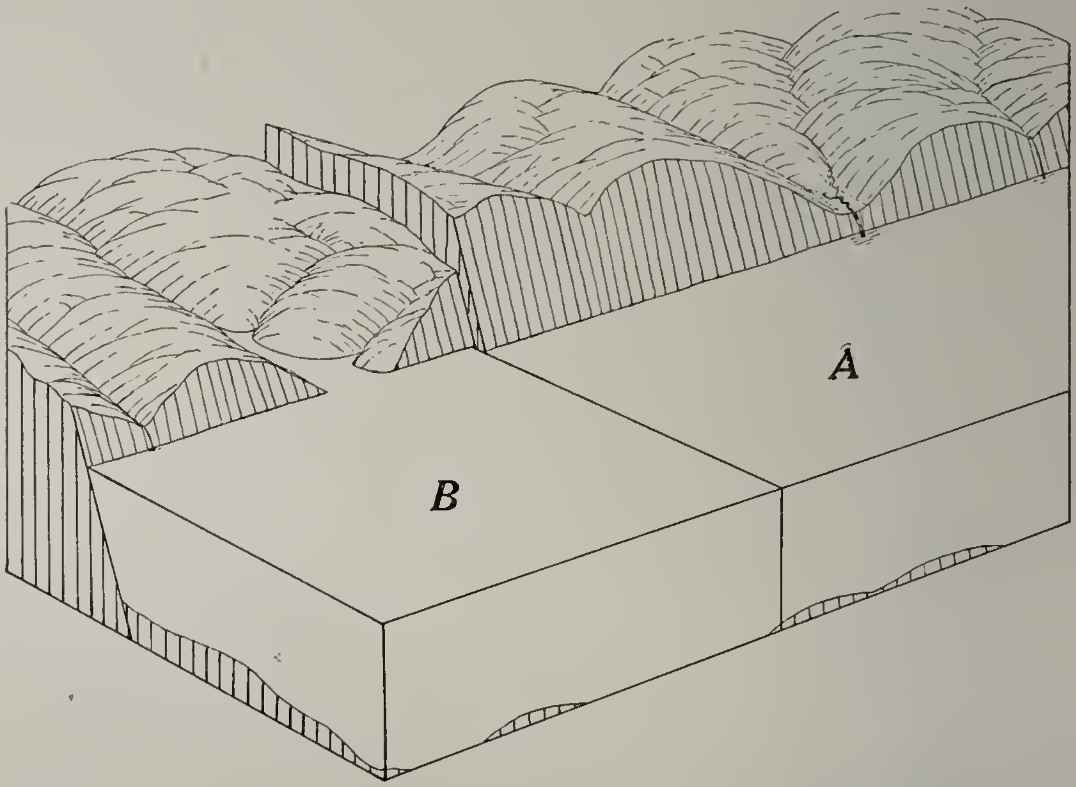

FIG. 4—Two initial fault coasts. In block *A* the landward block has risen or has remained stationary, while in block *B* it is slightly depressed. The seaward block is depressed to the same extent in *A* and *B*.

SEQUENTIAL FORMS WITH STATIONARY SEA-LEVEL

The Landward Block: Rejuvenation. In the case under consideration, where the pre-faulting surface is a land surface, it is to be expected that some of the valleys transected by the fault will drain inland and others seaward. The streams which flow seaward across the newly formed fault scarp, and at first cascade from hanging valleys, will begin at once to cut notches at their mouths. The larger of these streams will rapidly develop new, young valleys—steep-sided ravines at first—within the more mature valleys of the pre-faulting surface. Naturally the contrast of the post-faulting with the pre-faulting features will be most marked, and the merging of the former with the latter will be longest delayed when the pre-faulting surface is well advanced in the cycle of erosion and reduced to moderate or low relief. The heads of the young ravines of the revived streams will advance headward up the older valleys, and so, early in the history of the fault coast, the region will be characterized by composite topography. At the mouths of the minor seaward-sloping hanging valleys, however, notch-cutting will be slow, on account of the feebleness of the streams, and so the valleys of many small streams will long remain hanging.

In the case of transected valleys the slope of which is towards the landward block there will be, obviously, no tendency towards deepening by stream action, any deepening that was formerly in progress having been brought to an end when the streams lost their headwaters, that is to say, when they were beheaded by faulting. Such streams will now be misfits—too small for their valleys. Not possessing the power of rapid down-cutting, they, as rejuvenation of the topography progresses, will be liable to be captured by the vigorous tributaries of those revived streams, previously mentioned, which now flow down steep gradients to the sea in their newly deepened valleys. Thus it may happen that, if a coast has been formed by faulting and sufficient time has since elapsed to allow of adjustment of streams to the new conditions, some rivers will rise near the sea, flow inland for some distance and then, after turning sharply around to right or left, flow to the sea along courses more or less parallel with their headwaters. Somewhat similar conditions would result from the rapid consumption of a land area by marine erosion, but, since such rapid consumption of the land can take place only as an accompaniment of subsidence[5], in that case the stimulus to capture afforded by the rejuvenation of large neighboring streams would be absent, or, if not quite absent, at least much less effective. The presence of stream courses of this kind may be taken not as definite proof but as presumptive evidence that the land on which they occur is bounded by a fault coast. Their absence, on the other hand, does not disprove faulting, as streams flowing inland on the initial surface of the landward block may be infrequent or altogether absent. This will be the case when a coast has been formed by faulting not far inland from the former coast.

The Landward Block: Result of Depression. The changes in the topography thus far described are of the same nature as those that will take place on the surface of a block mountain in the neighborhood of the fault scarp that separates it from the adjacent lower-lying block, in that case unsubmerged. It makes no essential difference whether the block mountain has, in the process of faulting, been itself uplifted, has remained stationary, or has been depressed, provided only that it is relatively higher than the adjacent block, for, in all cases, the local base levels for streams on the pre-faulting surface of the mountain block are lowered throughout the length of the fault scarp.

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[5] A. C. Ramsay: Physical Geology and Geography of Great Britain, 5th edit., London, 1878, p. 497; F. von Richthofen: Führer für Forschungsreisende, Hanover, 1886, pp. 354–355.

In the case of the land bordering a fault coast, however, this is not so in every case. It has been pointed out above that the initial form of the shoreline with the landward block depressed will show, in some cases, reëntrants formed by the drowning of portions of valleys. At all points along the shores of these reëntrants local base levels are not only not lowered, but are replaced by permanent base level, the shore line within a reëntrant being simply that of a short length of depressed coast.

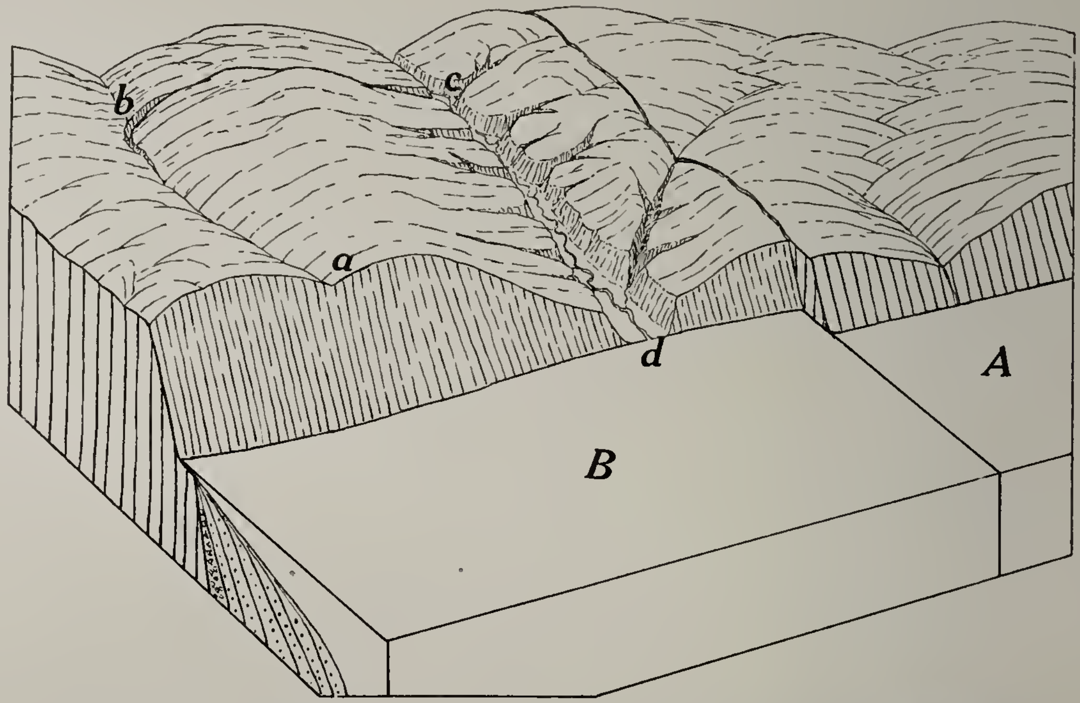

Fig. 5—Early sequential form, block *B*, developed from an initial fault coast, block *A*. In block *B* the inland-flowing stream *ab*, already beheaded by faulting, has been captured by a tributary *bc* of the revived seaward-flowing stream *cd*.

Along stretches of the coast scarp all the betrunked valleys will be initially hanging; but such will be only those of the smaller seaward-flowing streams, and consequently their lips will be but slowly notched. While valley-in-valley forms will be produced to some slight extent near the sea, general rejuvenation of the topography will not take place as in the case previously considered, and readjustments of stream courses by capture are not to be expected.

The larger valleys, which are drowned at their mouths, will be affected by bay-filling, delta-building, and up-valley aggradation; and those exceptional valleys that have accidentally been cut across by the fault just at sea-level will be unaffected until caused to degrade by retrogradation of the shore.

With increasing depression of the landward block we have the transition to a normal depressed coast previously referred to (Fig. 3); as the sea advances over the coastal land the fault scarp passes too far seaward to be of any further significance as a coast feature.

Shore Features in Profile. Scarps of the kind considered in this discussion are cut through here and there, at a very early stage in their history, by revived, outward-flowing streams; and, even if such streams are absent, the continuity of any fault scarp must soon be destroyed as a result of the excavation of ravines by new, consequent streams. It has been shown, however, by Davis[6] that, in the case of a fault scarp descending to a land surface, facets, triangular remnants preserving the form of the initial fault scarp, are to be found on spur ends even when dissection of the mountain block is far advanced. Such facets are subject to constant reduction in size as the spurs which they truncate are reduced in width and height by the widening of the valleys on either side, but the flat surface of a facet, though slowly wasted by soil creep, will be subject to little change of form beyond a certain amount of reduction of steepness and loss of sharpness of the edges. While any facets of such a scarp remain they can have retreated but little from the fault line, and they will therefore retain their alignment[7].

In the case of a fault scarp descending to the sea—an initial fault coast—, on the other hand, the scarp is attacked by wave action and will be worn back from the fault line. When the coastal land has been dissected by streams, the intervening spurs will end in facets or cliffs, but these will be true wave-cut cliffs and not remnants of the original scarp. It is true that, in the case we are considering, where the initial scarp descends with a steep slope into deep water, wave action must at first be feeble, as Fenneman[8] has pointed out, on account of the reflection of waves from the steep shore, and also on account of the absence of a resting place for loose material at a convenient depth to allow it to be picked up and made use of by waves in their attack on the face of the cliff. Such material as is dislodged by the impact of waves on the initial shore will slip immediately into deep water. When, however, the scarp, if initially too steep to cause waves to break, has had its steepness reduced by slumping and by slower surface creep, accompanied by accumulation of talus at the base of the slope (Fig. 6, *b* and *b'*), waves will break and, by their impact, will dislodge weathered material and joint-bounded blocks. Thus a nip will be developed (Fig. 6, *c*), slowly at first if there is still a lack of "tools", as in Figure 6, *b*,

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[6] W. M. Davis: The Mountain Ranges of the Great Basin, in Geographical Essays, Boston, 1909, pp. 725–772 (first published in *Bull. Mus. Compar. Zool. Harv. Coll.*, Vol. 42, 1903).

[7] *Ibid.*, p. 747.

[8] N. M. Fenneman: On the Lakes of Southeastern Wisconsin, *Wis. Geol. and Nat. Hist. Surv. Bull. 8*, 1902, p. 23.

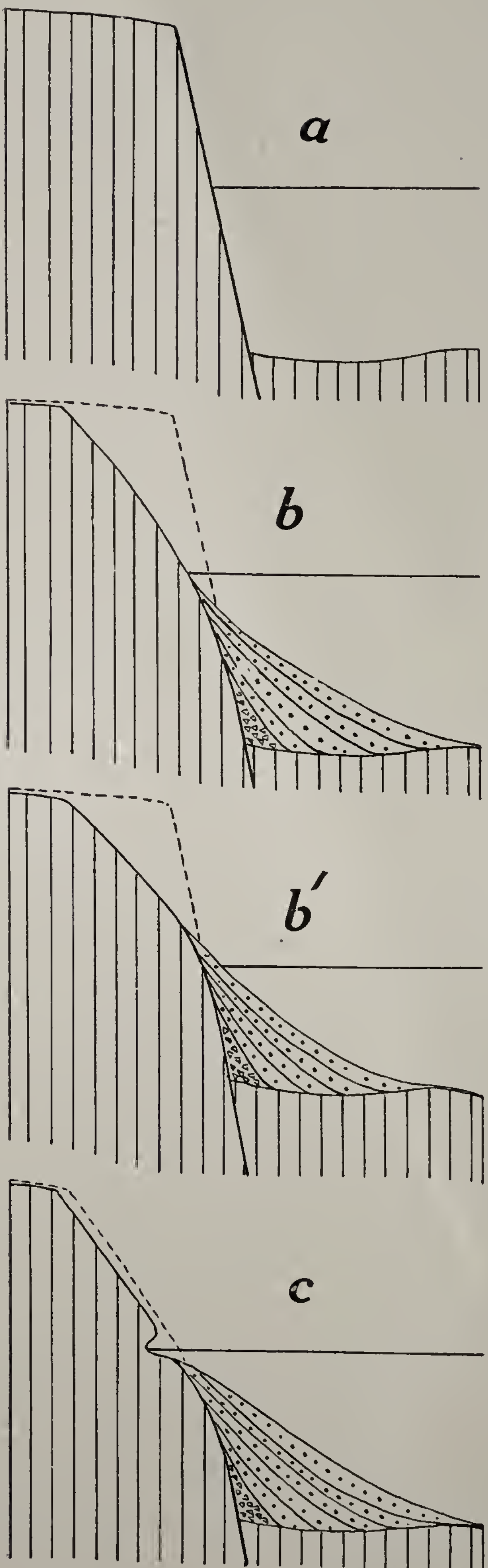

FIG. 6—To illustrate the beginning of wave attack on a steep coast. *a*, initial form; *b*, *b′*, *c*, sequential forms.

with which the waves can exert a truly abrasive action, but more rapidly if, as in Figure 6, *b′*, the material of the talus supplies tools[9]. The action will go on with increasing rapidity as the increasing width of the rock bench allows of the lodgment of coarse waste, insuring a supply of the material which most effectively assists waves to abrade solid rock.

After this stage is reached the conditions will be for a time those which allow wave action to work with maximum efficiency as a destructive agency. Deep water will still be present at a short distance from the shore, and so the waves will reach the rock bench on which they break with their energy unimpaired by friction of the bottom. Most of the finer and much of the coarser products of abrasion, moreover, will be withdrawn immediately from the arena, as they sink or slide to the bottom at a depth below strong wave action, if not quite below wave base. There will thus be no clogging of the shore with waste: bare rock will be exposed nearly continuously over the rock bench and at the base of the newly cut cliff, and this bare surface will be constantly exposed to abrasion during storms by that portion of the coarse waste which remains on it.

At the same time, the initial floor being assumed to be below strong wave action, deposition will go on extremely rapidly near shore, so that, very early in the history of the fault coast, the slope of the rock shelf or cut platform will be continued seaward by a built platform or "continental delta" (Gulliver). Thus a continental shelf will come into existence along the faulted margin of the land.

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[9] N. M. Fenneman: *op. cit.*, p. 23.

Though, at this stage, the combined cut and built platform will still be narrow, and though the slope to its outer edge, which will be situated at the depth of wave base, will still be somewhat steep, the underwater profile will now have attained the form described by Davis as "grade"[10] and by Fenneman as the "profile of equilibrium."[11] While the seaward slope of the platform, as it grows in width, will afterwards become progressively less steep, and the depth of water at any particular point on the landward portion of it will continue to increase,[12] the profile will remain graded throughout the cycle.

Provided that complete exportation of the waste to be deposited at another part of the coast-line does not take place as a result of currents sweeping along the stirred sediment above the wave base, a constant stream of material will, at this stage, be carried seaward over the edge of the platform to rest in layers upon and with the inclination of the continental slope. Such inclined layers are, as Chamberlin points out, foreset beds analogous with the foreset beds of a delta.[13] The platform will thus, normally, grow rapidly seaward; and the width of the built platform will soon be much in excess of that of the cut platform, this excess depending mainly (in the absence of loss of waste to, or gain from, other parts of the coast as a result of transportation by currents) upon the amount of waste supplied by streams as distinct from that broken by wave action.

Shore Features in Plan. While, as pointed out above, destruction of the initial scarp is likely to be at first somewhat delayed, after wave action has become effective the shore-line will retreat rapidly; and this will be evidenced by the failure of dissecting ravines to attain or maintain grade, especially in the more resistant rocks. In plan, one of the first effects will be that the shore-line will assume minor irregularities as marine erosion picks out the variations of resistance inevitably present in the shore rocks from point to point. A later effect will be the development of broad reëntrants where large areas of weak rocks reach the sea or where for any reason the initial scarp is low. At low parts of the scarp there is a smaller quantity of talus slipping down upon the shore as the base of the cliff is cut back, and, as the talus thus originating prevents further undercutting and so delays the work of marine erosion until it is itself transported seaward by the waves, it is clear that where the cliffs are low the shore-line will retreat rapidly, and that those portions of the shore-line where the cliffs are high will soon project somewhat as broad salients beyond the general line. Since, if we continue to assume that in the pre-faulting cycle of subaërial erosion planation was incomplete, the areas of weaker rocks will in that cycle have been reduced to lower relief than the resistant rock areas, it is apparent that broad differences of rock strength will be effective in two ways in producing sinuosity of the shore-line: first on account of the smaller resistance to erosion offered by the weaker rocks, and secondly on account of the smaller height of the initial scarp on these rocks (Fig. 7).

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[10] W. M. Davis: The Outline of Cape Cod, in Geographical Essays, Boston, 1909, pp. 690–724 (first published in *Proc. Amer. Acad. Arts and Sci.*, Vol. 31, 1896); reference on p. 701.

[11] N. M. Fenneman: Development of the Profile of Equilibrium of the Sub-aqueous Shore Terrace, *Journ. of Geol.*, Vol. 10, 1902, pp. 1–32; reference on p. 1.

[12] W. M. Davis: *ibid.*, p. 703.

[13] T. C. Chamberlin: Diastrophism and the Formative Processes: VI, Foreset Beds and Slope Deposits, *Journ. of Geol.*, Vol. 22, 1914, pp. 268–274; reference on p. 268.

It follows from the above argument that the absence of conspicuous salients and reëntrants developed as an adjustment to structure along the retrograded shore-line of a region of diversified structure is an indication of youth.

The changes in the features of fault coasts outlined in the foregoing paragraphs are those characteristic of their youth and adolescence. After the initial delay, to which reference has previously been made—a delay which may safely be assumed to be short—the stages of youth must, for reasons already stated, be passed through rapidly, and consequently we are much more likely to find fault coasts in the mature than in the young stage.

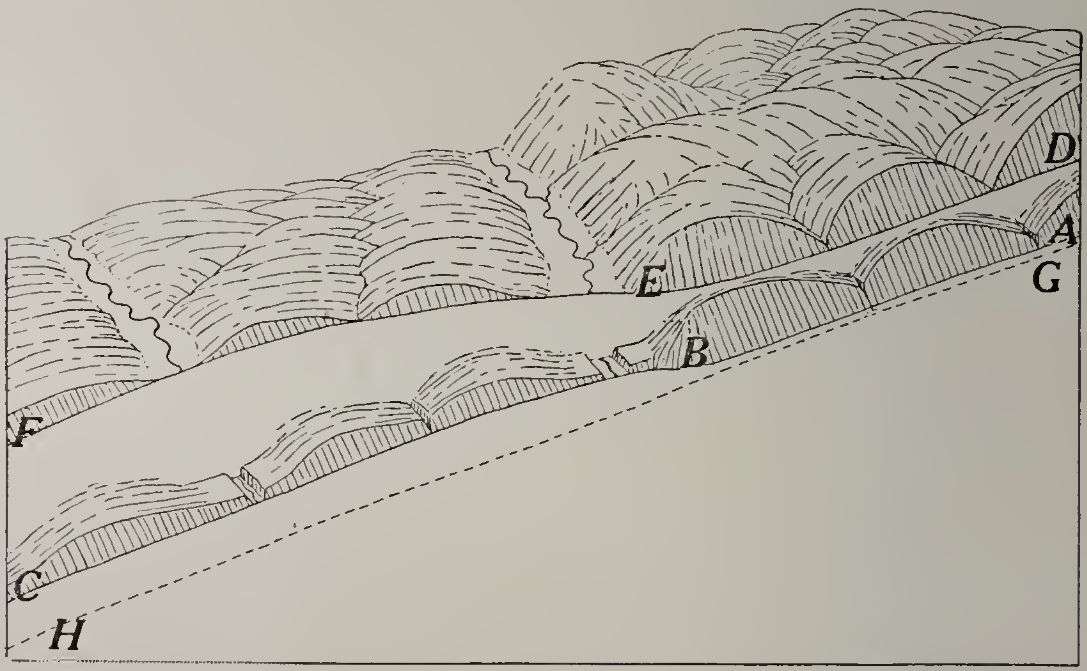

FIG. 7—Development of an embayment of the shore-line in an area of weak rocks. *AB*, resistant rocks; *BC*, weak rocks; *DEF*, form of the shore-line at a later stage; *GH*, line of the initial shore determined by a fault. In the pre-faulting cycle of subaërial erosion the weak rocks had been reduced to much lower relief than the resistant rock area.

Young fault coasts must, as we have seen, differ widely in many important respects from young coasts of other types; but when maturity is reached they must very closely resemble mature depressed coasts or uplifted coasts with contraposed shore-lines (Clapp; see footnote 17), the development of either of which may have occupied an immensely longer period.

Small development of salients and reëntrants as a result of adjustment to structure will still indicate probable fault origin early in the stage of maturity, and stream courses doubling back on themselves to reach the sea, if such have been developed, may be expected to persist. Otherwise proof of the fault origin of a mature coast may be impossible or may depend upon special, local features.

COMPLICATIONS

In the foregoing discussion it has been assumed that retrogradation of the shore-line goes on continuously; but it is possible that at some stage, perhaps quite early in the cycle, the waves become overloaded, owing perhaps to an increase in the amount of waste brought down by rivers, causing wave attack on the shore-line to become ineffective. In such a case adjustment of the form of the shore-line to the structure of the coastal land must cease, and progradation may occur. While the continental shelf will continue to grow in width the growth will take place entirely by addition of material at the outer edge.

INTERRUPTION OF THE CYCLE AFTER A PERIOD OF STILL-STAND FOLLOWING FAULTING

Interruption by Depression. Interruption of the first cycle by depression, after an appreciable amount of modification of the initial form has taken place, will give a new initial shore-line of the ordinary depressed type, which need not be further considered here.

Interruption by Uplift. Interruption by uplift taking place while the built platform of the interrupted cycle is still somewhat narrow, even though maturity may have been reached, will result in the exposure of a strip of sea floor as a narrow coastal plain with an appreciable seaward slope. Only this case will be considered (Fig. 8, blocks *B* and *C*).

The new initial shore-line (block *C*) will be simple, and the initial slope of the coastal plain will be such that the attack of the sea on the land will begin at once.

"The sea is able to begin the production of the submarine platform immediately off shore, shore-grade is quickly attained, youth and adolescence are of short duration, and the coast reaches a mature stage of development without the production of an off-shore bar."[14]

A recently published diagram (Fig. 9) of the western side of Osaka Bay, Japan, by Cushing,[15] which was received after this article was written, illustrates very well a sequential form developed from the stage represented in block *C* of Figure 8. A comparison of Figure 9 with block *C* of Figure 8, however, brings out certain differences. In the Osaka Bay example there appears to be no cut platform, indicating that deposition along the initial shore in the first cycle was even more rapid than has been assumed by the writer in the theoretical case, so that the effects of wave attack were still inappreciable when retrogradation was followed by

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[14] F. P. Gulliver: *op. cit.*, p. 184.

[15] S. W. Cushing: Coastal Plains and Block Mountains in Japan, *Annals Assoc. Amer. Geogrs.*, Vol. 3, 1914, pp. 43–61.

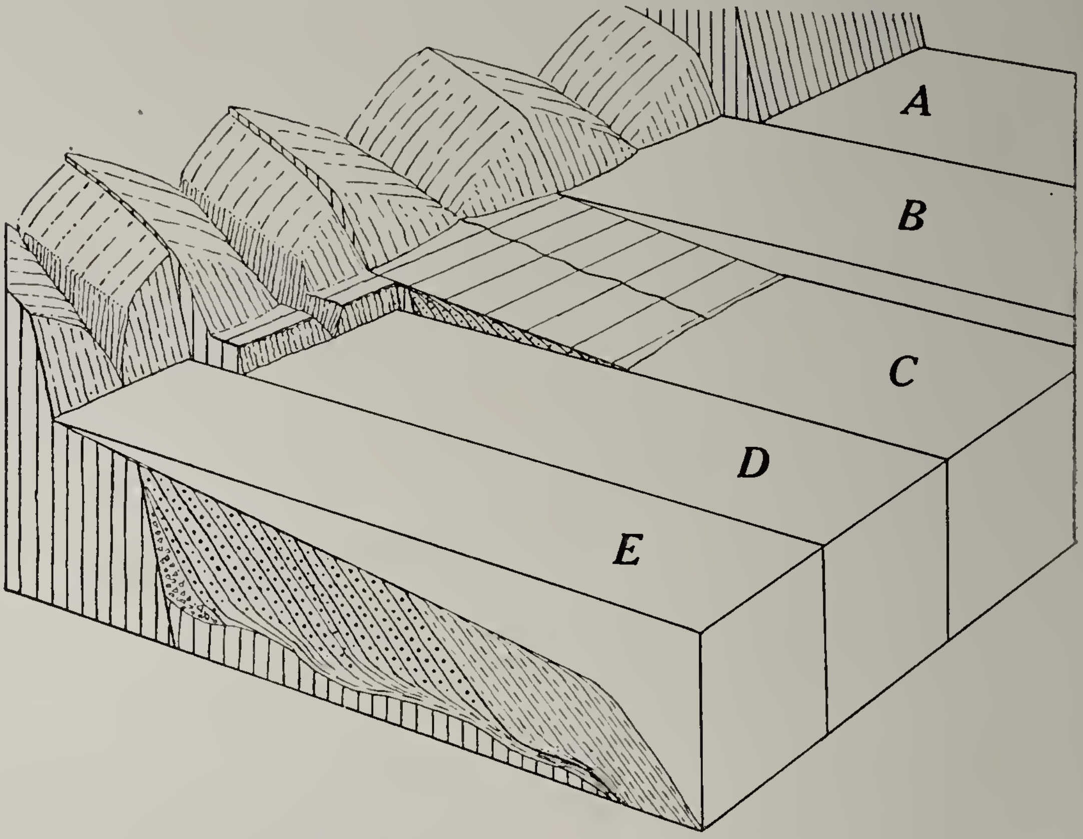

FIG. 8—A two-cycle fault coast. *A*, initial form of the first cycle; *B*, early maturity; *C*, the same, uplifted; *D* and *E*, sequential forms in the second cycle.

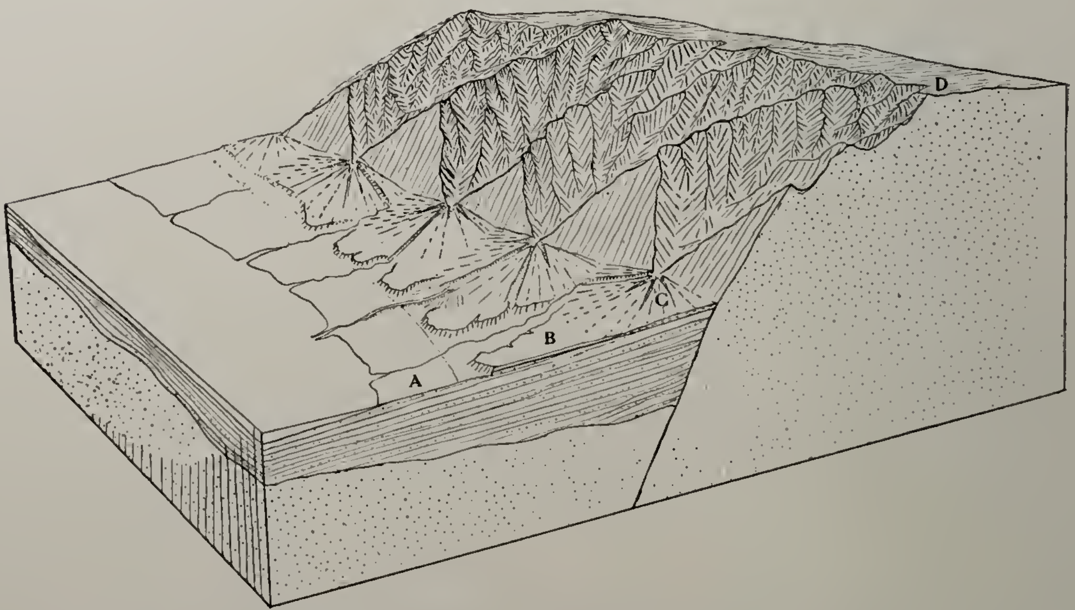

FIG. 9—Diagram of the western side of Osaka Bay, Japan. (After Cushing; reproduced with the author's permission.)

progradation, evidence of which is seen in the fans which border the old land. The stratification of the coastal plain is represented in the diagram as parallel with the surface, but, in his description of the region, Cushing mentions updragging of the strata as proof of renewed uplift of the landward block.[16] The question presents itself whether the observed seaward dip may not be due in part to inclined deposition, that is to the initial dip of the foreset beds of the coastal plain.

Let us now return to our consideration of the theoretical case and to our assumption of uninterrupted retrogradation. The unconsolidated material of the outer part of the narrow coastal plain (Fig. 8, block *C*), the built platform of the first cycle, will be rapidly cut back, and the waves will soon beat upon the reëxposed fault scarp forming the seaward boundary of the cut platform. Professor W. M. Davis has suggested to the writer that a fault scarp thus reëxposed after burial by sediment might be termed ''resurrected''; and so the fault coast developed upon such a scarp in a second or later cycle may be termed a ''resurrected fault coast.'' It will be noted that such a coast has something in common with the contraposed shore-line type of Clapp.[17]

Redistribution of the waste derived from the destruction of the coastal plain will cause the built platform of the new cycle to grow rapidly seaward.

Rejuvenation of the topography of the coastal land will have begun very soon after uplift as a result of rapid trenching by extended rivers across the steeply sloping coastal plain. As the shore is cut back further rejuvenation will take place. On resistant rocks, however, the amount of stream work accomplished during rapid recession of the coast to the resurrected fault scarp may be slight.

After this stage, the rate of retrogradation on an older mass of resistant rocks will be very much slower, but the cut platform of the earlier cycle will eventually be destroyed. Block *D* of Figure 8 represents the coast when the uplifted cut platform has been partially destroyed, and block *E* a later stage when it has been completely cut away. The history of the now fully mature coast need not be followed further.

Successive uplifts will be followed by precisely similar consequences provided that matters are not complicated by elevation above or near to sea-level of the older mass of the seaward block.

Interruption of the first cycle by diverse movements, tilting, warping, etc., may occur, but the complications thus introduced need not be discussed here.

EXAMPLES OF FAULT COASTS IN NEW ZEALAND

THE MARLBOROUGH COAST

A Resurrected Fault Coast. The east coast of Marlborough (Fig. 10) from Cape Campbell southwestward to Kaikoura Peninsula may be described as a mature, resurrected fault coast with a projecting delta, built by a large river—the Clarence—in the first cycle, cut back somewhat after uplift, and added to in the present cycle, the modern portion of the delta passing northeastward into a continuous strand plain of very recent origin[18] (Figs. 12, 13, and 14). The rocks of the region are mainly weak mudstones, resistant, deformed limestone and older, resistant, deformed clastics,[19] each in turn forming the shore for a distance of several miles. Unfortunately, the physiographically very important boundaries between the mudstones and the limestones are not shown on the only detailed maps of the region, those of McKay.[20]

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[16] S. W. Cushing: *op. cit.*, p. 46.

[17] C. H. Clapp: Contraposed Shorelines, *Journ. of Geol.*, Vol. 21, 1913, pp. 537-540.

The mudstone areas are of moderate relief, having been reduced to mature forms and in some places completely planed down during periods of still-stand occurring between movements of uplift, the last of which took place so recently that, even on these weak rocks, small streams are not

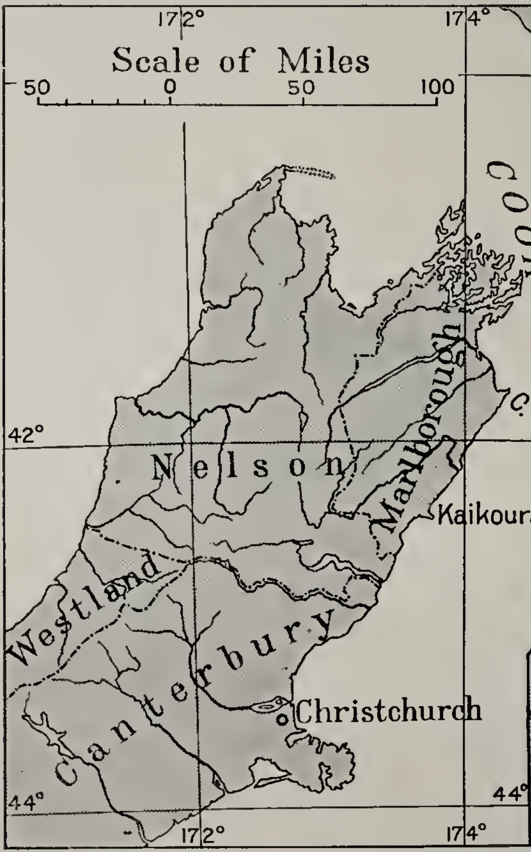

FIG. 10—Sketch-map of central New Zealand.

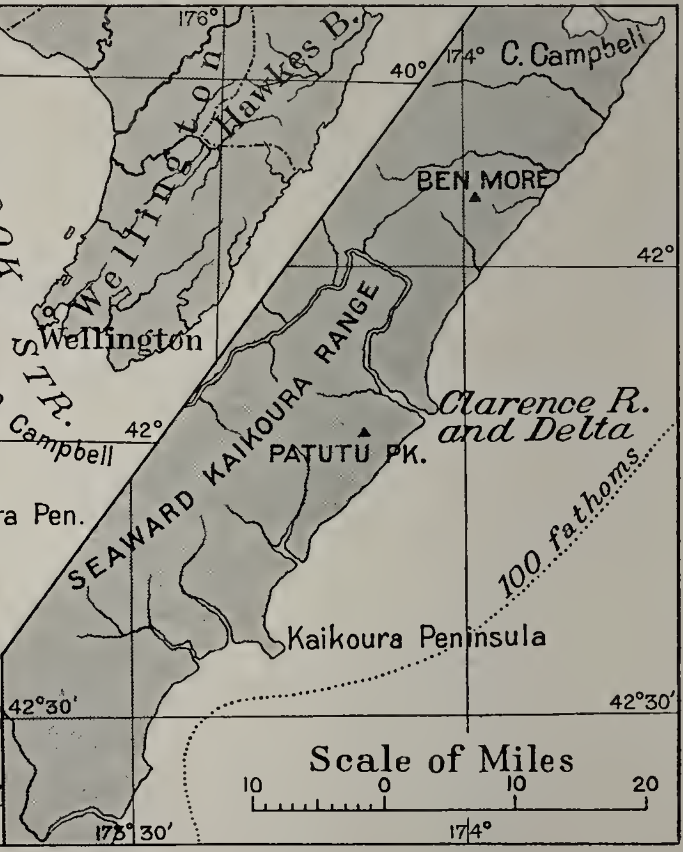

FIG. 11—Sketch-map of the east coast of Marlborough.

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[18] C. A. Cotton: Preliminary Note on the Uplifted East Coast of Marlborough, *Trans. N. Z. Inst.*, Vol. 46, 1914, pp. 286-294; reference on pp. 291-293.

[19] The mudstones referred to in the text are the predominant beds underlying and overlying the Amuri limestone in the area mapped by McKay (see footnotes 20 and 21) as "Cretaceo-Tertiary and Cretaceous;" the limestone referred to is the Amuri limestone of the same series; and the resistant, deformed clasties are the pre-Cretaceous rocks or older mass of the region. In addition to the rocks mentioned a very resistant conglomerate, the Great Marlborough conglomerate (J. A. Thomson: Report of Palaeontologist, *Geol. Surv. of N. Z., 7th Ann. Rept.*, 1913, pp. 121, 123-134; C. A. Cotton: On the Relations of the Great Marlborough Conglomerate, etc., *Journ. of Geol.*, Vol. 22, 1914, pp. 346-363), reaches the shore at several places with mudstone on either side.

[20] A. McKay: On the Geology of the East Part of Marlborough, *Geol. Surv. of N. Z., Rept. Geol. Expl. dur. 1885*, pp. 27-136, 1886; map opp. p. 42.

A. McKay: On the Geology of Marlborough and South-east Nelson, *Geol. Surv. of N. Z., Rept. Geol. Expl. dur. 1888-89*, pp. 85-185, 1890; map opp. p. 96.

yet graded with respect to present base level and larger streams still occupy narrow-floored, precipitous-sided valleys.[21] The measure of the relief rarely exceeds 600 or 700 feet.

On the resistant rocks, both the limestone and the older-mass clastics, the relief is strong, a limestone peak, Ben More, four miles from the sea reaching a height of 4,081 feet, and the older-mass rocks southwestward of the Clarence mouth rising to 2,190 feet one mile inland, to 3,820 feet in Patutu Peak two miles inland, and to much greater heights in the Seaward Kaikoura Range at an increasing distance from the sea. (Fig. 15 is a profile of the coast at this point, drawn to the same horizontal and vertical scale.) On other parts of the coast the relief on these rocks is somewhat less strong, but they nowhere present subdued forms. In these rocks the rivers, with the exception of the largest, are not graded, and dissection with respect to present base level is still in a very young stage.

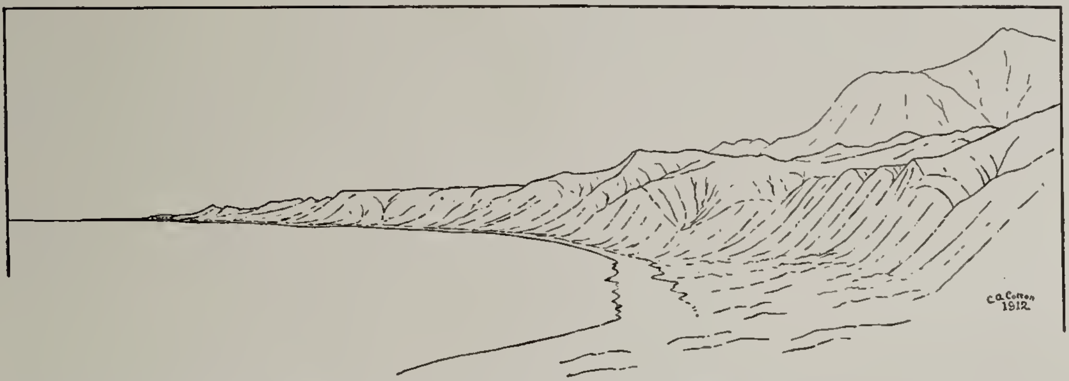

FIG. 12—View of the Marlborough coast, looking southward. The cliffs of the mature coast appear on the right, the strand plain in the foreground, and the projecting delta on the left.

The continuous cliffs of the coast, though bordered now by a strand plain, are remarkably well preserved even where composed of mudstone, thus showing that, quite recently, the shore-line was receding at all points.

The line of these cliffs has the simple curves of a mature coast, but it exhibits a remarkable indifference to structure, explicable only on the hypothesis of rapid development from an initial faulted form outlined on an earlier page, and quite inexplicable on the only alternative hypothesis, that of development to maturity by an enormous amount of cliff-recession from some other initial form of coast. A mature coast developed in the latter way on rock formations so strongly contrasted as those of Marlborough would show pronounced salients on the areas of resistant rocks, separated by bays where the weak mudstones reach the sea, on account both of the small resistance of the latter to wave attack and of their low relief. It seems probable that the width of the combined cut and built platforms would, in the latter case, also be much greater than that of the continental shelf[22] of the Marlborough coast. This is, however, debatable since the proportion of the total width occupied by the cut platform is a matter of inference; but reasons will be given in the next section for the belief that the cut platform is relatively narrow.

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[21] C. A. Cotton: *op. cit.* sub 18.

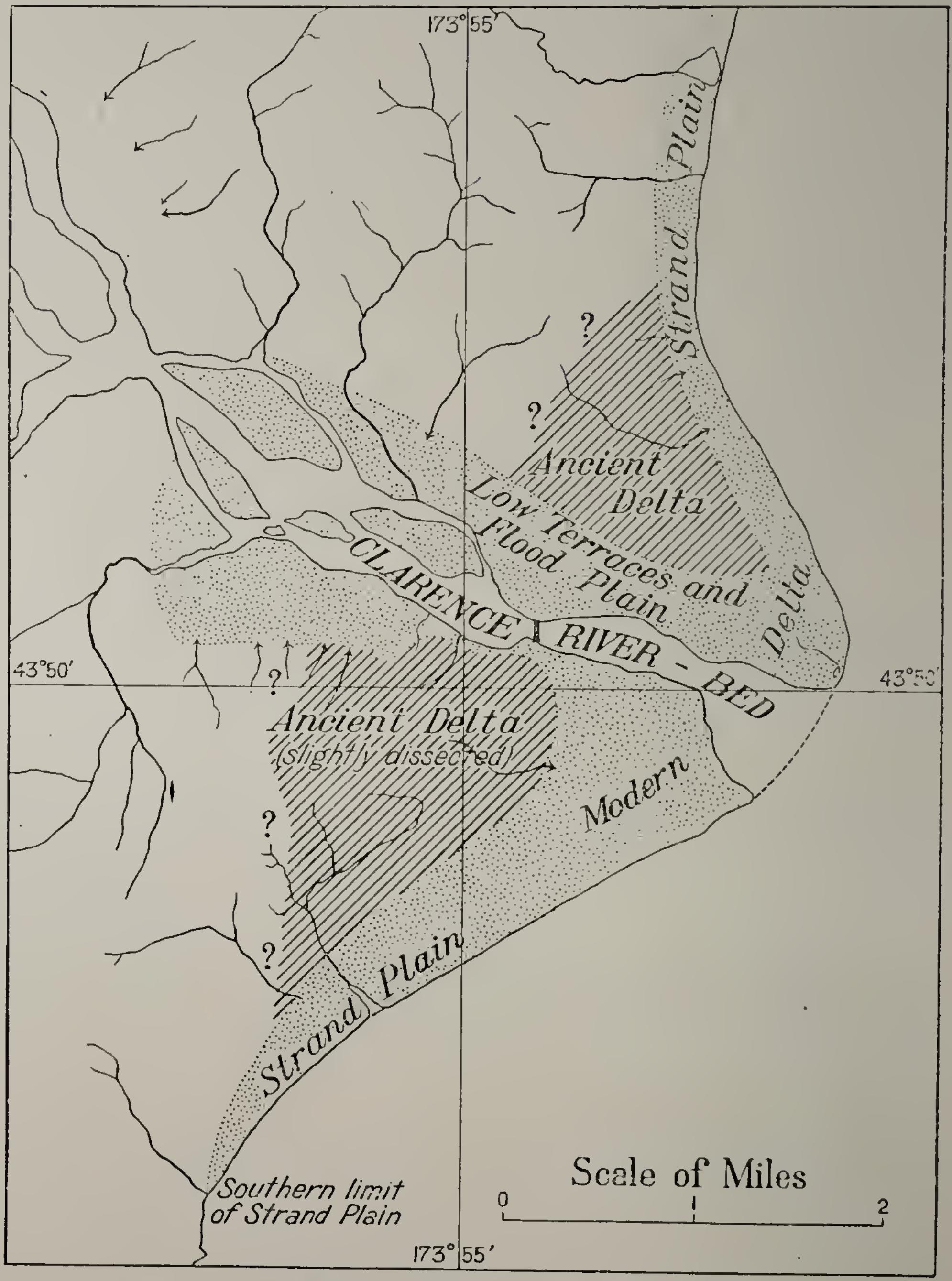

FIG. 13—Physiographic sketch-map of the Clarence delta.

Along this coast there is a general absence of islands, indicating that the depth to which the seaward block subsided along the initial fault was considerable; but at the southwestern end there is one large, land-tied island, Kaikoura Peninsula. This "island" certainly does not owe its position as the only prominent salient on the coast to any great power of resistance to wave attack possessed by its rocks, for it is composed of weaker materials than the adjacent mainland. The initial island was probably the unsubmerged portion of an unevenly depressed seaward block. Its flat top and terraces at lower levels indicate that it has been completely planed off once by marine erosion and partially planed during several later periods of still-stand separating episodes of uplift. The "island" is now tied to the mainland by the confluent deltas of several streams forming the Kaikoura Plain, where locally the shore-line has advanced seaward owing to a very abundant supply of waste from the Seaward Kaikoura Range.

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[22] It appears to the writer desirable to use the well-established term "continental shelf" for this feature even when it fringes an island. The use of the adjective "continental" is unfortunate, but the use of a second term "island shelf" for what is genetically the same feature does not afford a satisfactory way out of the difficulty.

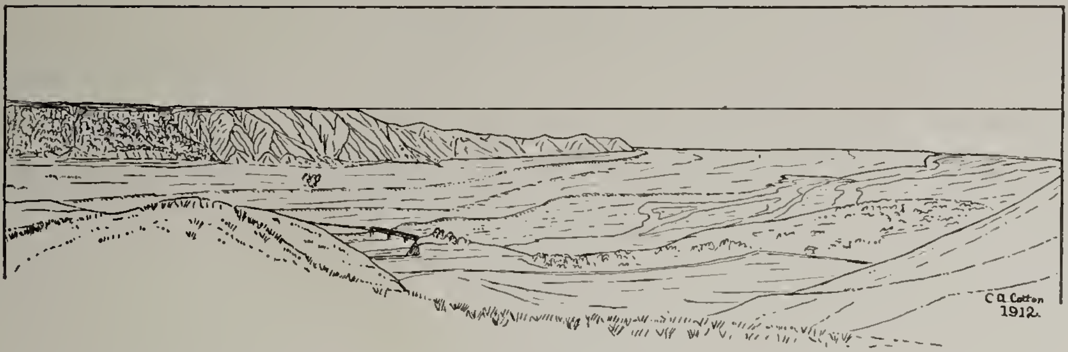

FIG. 14—View looking seaward from the surface of the uplifted Clarence delta, showing part of the uplifted delta on the left, low terraces and flood-plain of the Clarence River in the center, and the modern delta on the right.

Bordering this mature coast there is, as required by the hypothesis, a continental shelf or submarine platform (see Figs. 11 and 15), the outer edge of which is about twelve miles from the shore and at a depth of about seventy fathoms. Though not very numerous soundings have been recorded, the Admiralty chart (New Zealand, Sheet 8) shows a sufficient number to make it apparent that the platform slopes evenly and that the underwater profile is graded.

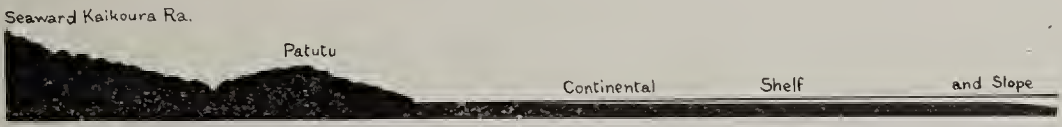

FIG. 15—Profile of the coast southward of the Clarence River. (The profile of the continental slope is hypothetical, as the available soundings indicate merely deep water, not definite depths, beyond the edge of the shelf, which is situated at a depth of about 70 fathoms.)

The Fault Line Must Be Situated Close to the Present Shore-Line. For reasons which follow, the writer considers it highly improbable that the shore-line can have receded more than a very short distance from the fault line. The evidence in favor of this view also seems to afford proof of the correctness of the application of the fault hypothesis to this coast.

It is important to recall that the average relief of the land immediately behind the present shore-line is very strong; also that the dissecting valleys of the present cycle are quite immature even on the weakest rocks, indicating an extremely youthful stage of dissection in the present cycle; and finally that there is an absence of notable salients and reëntrants in the shore-line itself. In view of these facts it seems impossible that the coast can have been cut back far from the fault line since the last uplift. If, for example, even a mile or two of recession had taken place on a coast composed in part of very resistant and in part of very weak rocks, with a straight shore-line transecting all structures indifferently as the mature result, the rate of recession of the coast on the very weak rocks must have been enormously retarded to allow recession on the neighboring mountainous areas of very resistant rocks to keep pace with it. Under such conditions the areas of weak rocks would, at the same time, have been reduced by subaërial agencies to lowlands of small relief with all valleys widely opened and all streams graded with respect to present sea-level as base level; whereas, as pointed out above, the dissection even on these areas of weak rocks is characterized by extreme youth of the erosion features. Only a small fraction of the twelve-mile-wide submarine platform can, therefore, be regarded as cut landward from the fault. The remaining larger fraction must be an apron of waste built out upon the submerged block. This is not surprising when the large quantity of waste constantly being poured into the sea by the torrential stream of this mountainous region is taken into account. The supply of waste from this source is undoubtedly far in excess of that resulting from wave action along the shore, and so it is only to be expected that the waste apron will greatly exceed in width that portion of the platform cut upon the basement rocks of the landward block.

The waste-apron portion of the submarine platform will really consist of two distinct portions, the outer a true built platform, an entirely constructional feature built outwards since the present position of sea-level was assumed, and the inner a part of the cut platform, which has been cut, however, upon the waste apron (or aprons) built forward when the whole region stood lower and when the sea was attacking the coast at higher levels. (In Figure 8 the theoretical structure of such a platform, developed in two cycles, is shown in section on the side of block *E*. The sediment of the current cycle is indicated by lighter lines than that of the earlier cycle.)

The Coast Is Not a One-Cycle Fault Coast. Reasons must now be given for describing the Marlborough coast as a mature, resurrected fault coast as distinguished from a mature, one-cycle fault coast. As indicated in Figure 8, block *D,* a resurrected fault coast is characterized in its early mature stage by the presence of an uplifted cut platform or remnants of one. At a later stage, however, these will disappear (block *E*); and the narrower the cut platform of the earlier cycle the shorter-lived it will be in the later cycle. A few narrow remnants of uplifted marine cut platforms are present in Marlborough, but they are not as a rule conspicuous features. Their general absence, in view of the small amount of recession of the coast landward from the fault which, it seems, can possibly have taken place in the present cycle, must indicate that at no period since the initiation of the coast fault has recession proceeded far landward.

In addition to the remnants of uplifted cut platforms the Marlborough coastal region presents evidence of extremely recent, strong uplift, chiefly in the form of (a) rejuvenated topography well developed on the areas of weak rocks but only incipient on the areas of resistant rocks; and (b) the presence at the mouth of the Clarence River of the delta previously referred to, which is as yet but little dissected though uplifted 500 feet.[23]

This delta of the Clarence was built out from a shore the line of which practically coincided with that of the present coast, and that shore appears to have been a young, one-cycle fault coast the scarp of which descended into deep water, for the massive conglomerate of which the foreset portion of the delta is composed may be traced to sea-level, 500 feet below former sea-level, at a distance of about a mile from the former shore, and it extends to an unknown greater depth. The presence of this delta, therefore, proves that the uplift of which there is evidence took place later than the formation of the initial scarp; that is to say, it proves that the coast is of the "resurrected" type.

The Post-Faulting Uplift Regional, Not Differential. There remains to be considered an alternative hypothesis that suggests itself in explanation of the development of the present coast from the fault coast of the first cycle (that in which the 500-ft. delta was built). To this may be given the explanatory name "hypothesis of renewed faulting," thus distinguishing it from the "hypothesis of regional uplift following faulting" upon which the preceding arguments are based.

Obviously renewed faulting with uplift of the landward block only, and the formation of a new initial fault coast, is a possibility that must be taken into account. The hypothesis has, indeed, the advantage of dispensing with the necessity of explaining the destruction of a coastal plain after uplift. In the concrete case under discussion, however, the hypothesis fails to explain the uplift of the Clarence delta; for the delta was, as shown in the last section, built out upon the seaward block. Clearly, therefore, in the case of the Marlborough coast, post-faulting uplifts have affected the seaward as well as the landward block; in other words, they have been regional and of the same character as those postulated in the theoretical study of resurrected fault coasts on an earlier page.

The diagrams in Figure 16 represent stages in the growth of a composite (i. e., two-cycle or multi-cycle) delta, which, like that of the Clarence, has been built by a vigorous river in front of a fault coast where wave action has usually been powerful, sometimes succeeding in cutting back the shore even at the river mouth in the face of an abundant supply of waste, though sometimes there has been an excess of waste leading to active delta-building and progradation of the shore. In the figure, *A* represents the initial stage, and it is assumed that a preëxisting valley of the river has been transected by the scarp of the initial coast. *B* represents

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[23] C. A. Cotton: *op. cit.* sub 18.

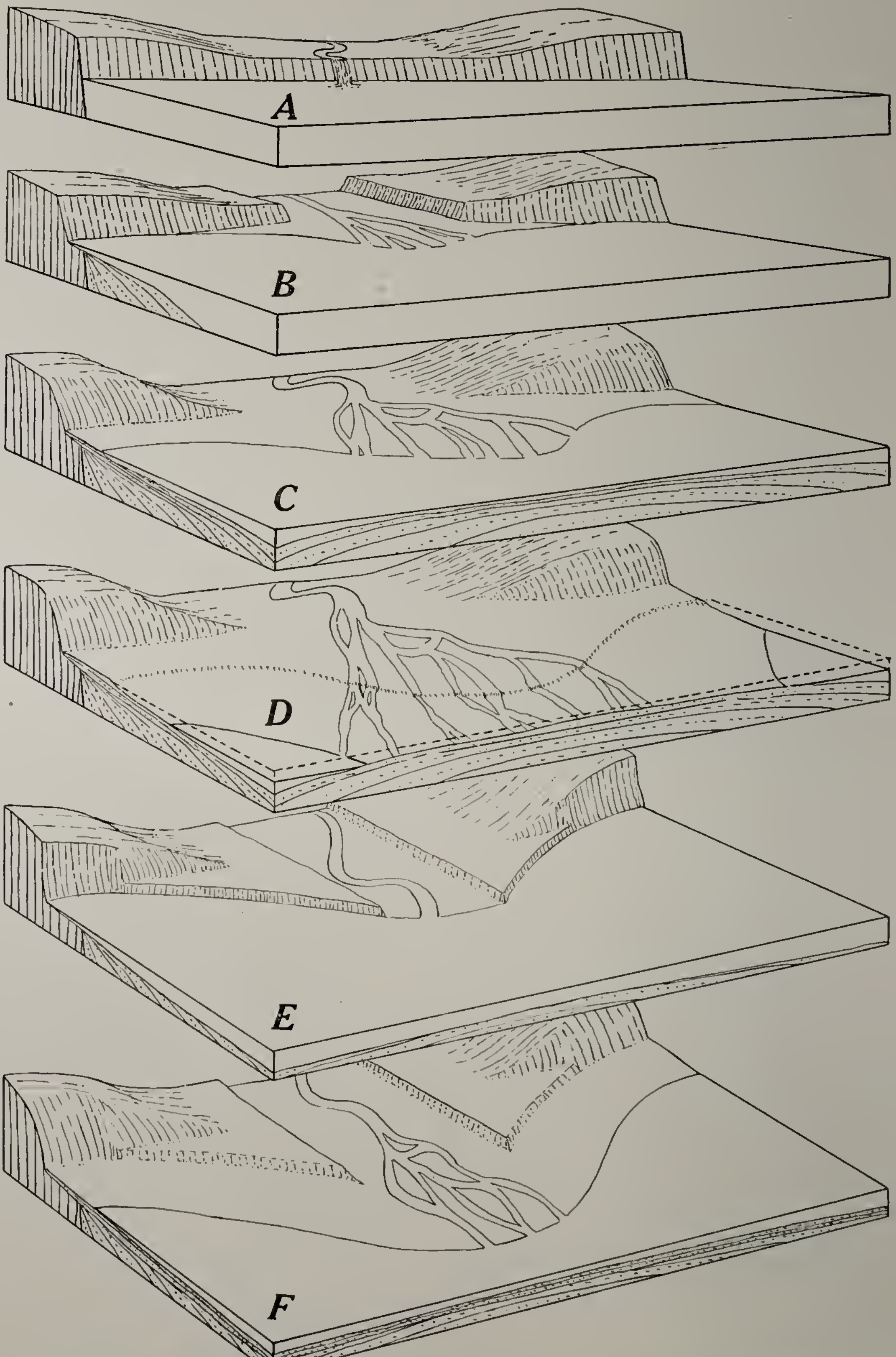

Fig. 16—Diagrams of stages in the growth of a composite delta with a history similar to that of the Clarence delta.

a stage when the shore has been cut back somewhat and a submarine platform has taken form, allowing the growth of a delta to begin. At stage *C* the submarine platform and delta have grown considerably. *D* represents the same stage as *C* after uplift has taken place, the form represented being now the initial form of a new cycle. At stage *E* the attack of the waves has triumphed for a time, as has certainly been the case at a corresponding stage in the history of the Clarence delta, so that the front of the uplifted delta has been cut away. *F* represents a stage of renewed delta-building and progradation of the adjacent coast corresponding to the present state of the coast in the neighborhood of the Clarence River.

EXAMPLES NEAR WELLINGTON

The coasts of the southwestern extremity of the North Island of New Zealand, both that facing southward and that facing northwestward, are regarded by the writer as sequential forms of fault coasts. In an earlier paper, in which these coasts have been described,[24] evidence of uplift has been put forward, and so the coasts may be provisionally termed resurrected fault coasts; but it remains uncertain whether the uplift has been regional or has been by renewed faulting. There is in this case no uplifted delta, nor has any portion of the platform built beyond the line of the initial coast, if uplifted, escaped destruction to bear witness that the seaward region has shared in the uplift of the land.

While evidence of uplift of the land is to be found in both the eastern and western portions of the area included in Figure 17, there is a central area of subsidence, the area occupied by Port Nicholson and a small adjacent land area with an obviously drowned shore-line, and on the northwestern coast there is an area of less extensive subsidence including the drowned valleys forming Porirua Harbor. It is uncertain whether the movements resulting in the production of these sunken areas were or were not in part contemporaneous with the rise of the adjacent areas, but they seem to have been mainly later.

The uplift of over 200 feet in the eastern and western portions of the Wellington district, which initiated the latest of a succession of brief cycles of both subaërial and marine erosion (the latter slightly disturbed by a further small movement within historic times), must have taken place very much earlier than the latest significant movement in the Marlborough coastal region. This is indicated by the fact that valleys in the Wellington area have been well opened out in this cycle though they are excavated in resistant rocks. In view of this fact it is at first sight rather surprising that considerably larger areas of uplifted cut platforms are preserved, corresponding to stage *D* of Figure 8; but the explanation appears to be that the duration of some at least of the earlier cycles (subsequent to the formation of the initial fault) was also longer here than in Marlborough. Platform remnants on the southern coast are shown in Figures 18 and 19. In Figure 18 remnants of two platforms and in Figure 19 remnants of three are seen one above another.

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[24] C. A. Cotton: *op. cit.* sub 18.

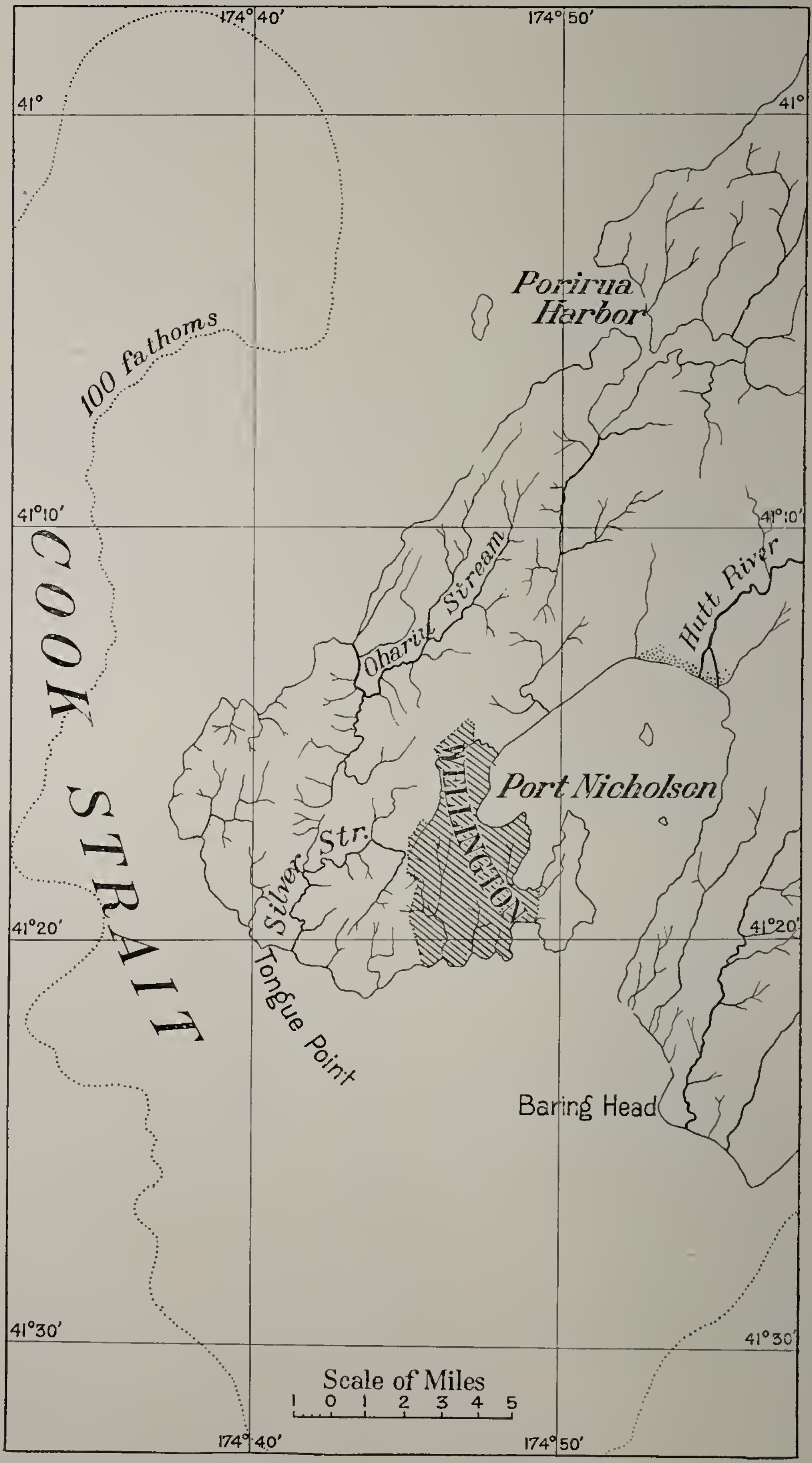

FIG. 17—Sketch-map of the coasts in the vicinity of Wellington.

The features of the shore-line are of a similar nature to those which will be found in the case of a contraposed shore-line;[25] but the writer considers the explanation based on the fault-coast hypothesis probably correct because of the presence here of streams rising near the coast and making long excursions inland before eventually reaching the sea, a type of stream course which was shown, on an earlier page of this paper, to be likely to occur on a fault coast. Among the most conspicuous of such courses are those of the Ohariu and the Silver Stream (Fig. 17).

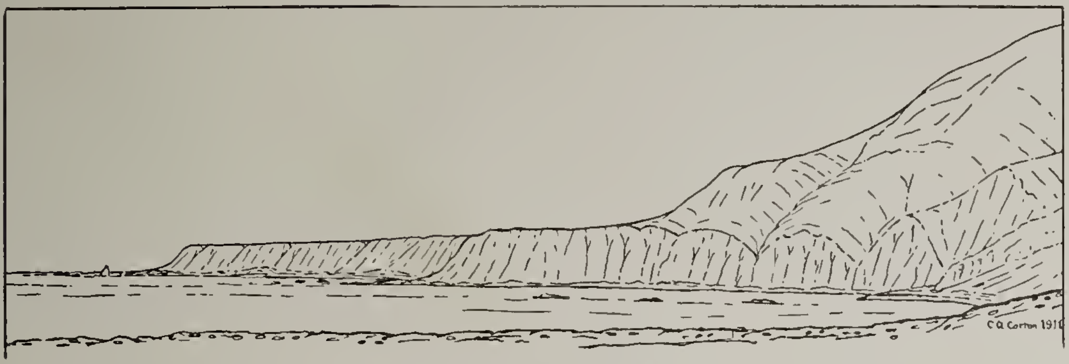

FIG. 18—Two remnants of cut platforms, each with a thin covering of gravel, at Tongue Point, Wellington. The lower and broader platform is at a height, at the rear, of 240 ft., and the upper remnant, of 450 ft.

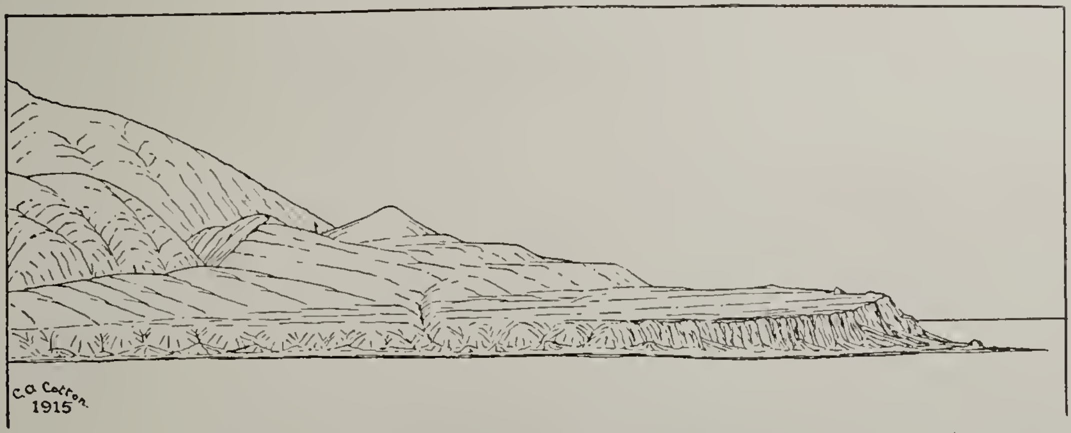

FIG. 19—Platform remnants at Baring Head, Wellington.

The narrowness of the continental shelf does not in this case indicate youth, for its growth is interfered with by the strong tidal currents of Cook Strait. The irregularity of the edge of the shelf as defined by the one-hundred-fathom line (Fig. 17) is, no doubt, due largely to the same cause. A pronounced salient of the shelf opposite the subsided Port Nicholson area, where a reëntrant of tectonic origin might be looked for, emphasizes the fact that the shelf is largely a built feature. This salient is difficult to explain, for, though the Hutt River here supplies a large and continuous stream of waste, most of this is trapped in the Port Nicholson depression, which has not yet been filled. Possibly the shelf broadens normally with increasing distance from tide-swept Cook Strait, but has been cut off southeastward by recent subsidence which has probably taken place beyond the area with which we are at present concerned.

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[25] C. H. Clapp: *op. cit.* sub 17.

ONE-CYCLE FAULT COASTS

A Miniature Example at Wellington. A miniature example of a one-cycle fault coast is provided by that portion of a young fault scarp at Wellington which forms the northwestern shore of Port Nicholson (Fig. 17). The fault scarp was first described by Bell[26] and later by the writer.[27]

The scarp trends southwest and northeast and runs inland in both directions, its northeastern continuation extending far up the valley of the Hutt River. The fault cuts a sub-mature surface with a somewhat steep general slope towards Port Nicholson, the proximal portions of transected spurs alternating with streams the largest of which are mature at their mouths. The initial scarp facing the sea must have presented the appearance of a sharply cut section, the trace of which in plan would be a simple line. At sea-level this line would be broken only by slight embayments at the mouths of three of the larger streams the valleys of which were slightly drowned by a small movement of depression on the landward or upthrow side of the fault. The height of the scarp above sea-level would vary according as it cut across spurs or ravines, and it would, therefore, present the appearance of a line of facets. The slope of the scarp would be probably less steep than the hade of the fault, for, if the latter were steep, material would slide away from the growing scarp until a slope of equilibrium was reached. All the smaller streams would cascade from the mouths of hanging valleys. Deep water would extend close in to the base of the scarp unless a very large amount of talus had accumulated during faulting. In any case there would be no wave-cut platforms at the base, such as would be present if the line of cliffs had been cut by marine erosion.

These characteristics are still recognizable, though they have been somewhat modified in the post-faulting period. Two types of post-faulting modifications can be recognized—subaërial and marine. As subaërial modifications we find, throughout the length of the scarp, notches that have been cut by revived streams in the bottoms of pre-faulting ravines; but the smaller of these are still hanging. At the southwestern end of the scarp, where it runs inland, the edges of the initial facets are rounded off, mainly, no doubt, by soil creep. As a result of modification by marine erosion there are now, along the shore of Port Nicholson, sharp-edged facets which are not, strictly speaking, remnants of the fault scarp, but are wave-cut cliffs worn back a little from the fault line. Narrow rock platforms are present at the base of these cliffs. Small deltas have filled the drowned mouths of the larger streams and now project slightly beyond the general line of the shore, while the Hutt River, entering Port Nicholson from the northeast, has built a larger delta part of the way along the scarp.

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[26] J. M. Bell: The Physiography of Wellington Harbour, *Trans. N. Z. Inst.*, Vol. 42, 1910, pp. 534-540.

[27] C. A. Cotton: Notes on Wellington Physiography, *Trans. N. Z. Inst.*, Vol. 44, 1912, pp. 245-265; reference on p. 257.

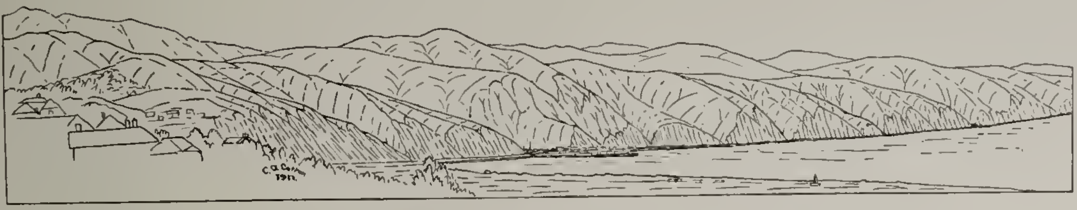

FIG. 20—The one-cycle fault coast formed by the Wellington fault scarp.

The Coast of Southern Marlborough. A short stretch of coast that is perhaps a young, one-cycle fault coast is to be found in southern Marlborough, extending a short distance southwestward from Kaikoura Peninsula (Fig. 11).

The most remarkable feature of this coast is the narrowness, or absence, of the continental shelf. A depth of 200 fathoms "and no bottom" is recorded on the Admiralty chart (New Zealand, Sheet 8) at a distance of about two miles from the land, and a great depth of water is vouched for by local fishermen. This suggests recent subsidence along a fault line close to the present shore; and the land presents the appearance of a fault scarp (Fig. 21), as though a strip had recently subsided along an arcuate line a little within that of the initial scarp of the resurrected fault coast to the northeast that has been already described. A very similar result might, however, have been produced by off-shore subsidence as a result of renewed movement on the original fault (if we may assume that the fault coast now recognized to the northeast formerly extended along this portion of the coast also). Such off-shore subsidence would in most cases be followed by increased activity of wave action on the shore, producing a cliffed shore-line not unlike that of a young fault coast. Further study in the field is necessary before a more definite statement as to the nature of this strip of coast can be made.

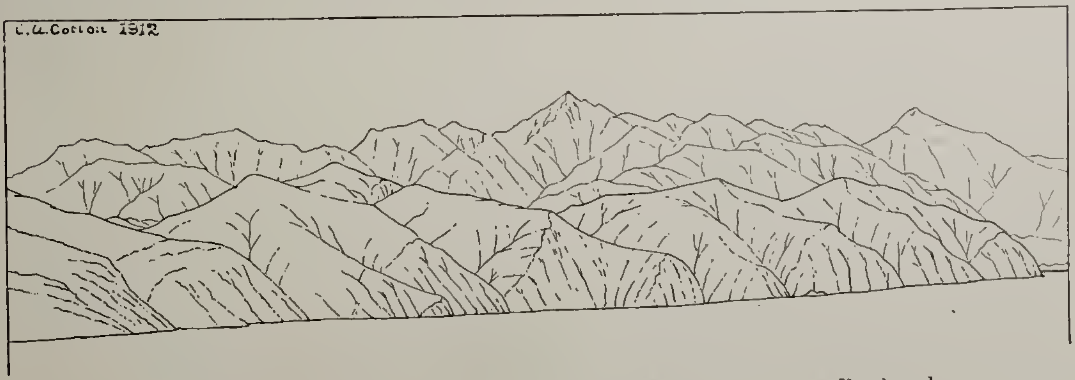

FIG. 21—The Marlborough coast southwestward of Kaikoura Peninsula.

The Thames Fault Coast. This article would be incomplete without a brief reference to the western coast of the Hauraki, Coromandel, or Cape Colville Peninsula in the North Island of New Zealand (Fig. 22), where, in the neighborhood of the mining town of Thames, the presence of a fault coinciding with the shore-line and hading seaward at an angle of 45° has long been known from mining operations. It is known locally as the "beach slide." A long and imposing fault scarp which is the superficial development of the beach slide and associated parallel faults was first recognized as such by Lindgren,[28] and the southern portion of it has recently been described by Henderson,[29] who has also summarized the observations of a number of other authors on the subject.[30]

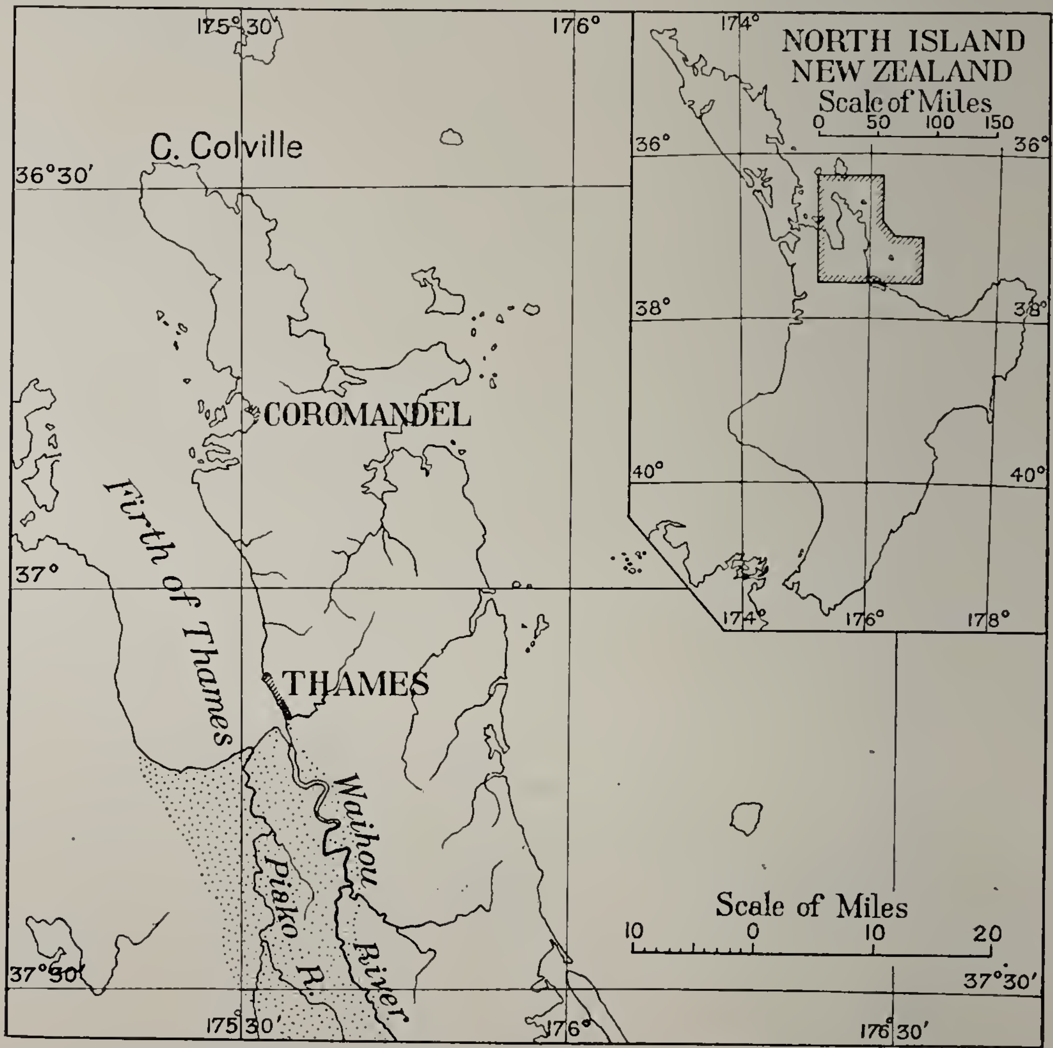

FIG. 22—Sketch-map of the Hauraki Peninsula. The inset map of the North Island of New Zealand indicates the locality.

The shore-line of the fault coast may, by its simplicity on the map (Fig. 22), be recognized, extending about twenty miles northward of Thames. It extends also many miles to the south, separating a maturely dissected, nountainous region, composed mainly of volcanic rocks, on the east, from down-thrown area, invaded by the sea, on the west. A great part of his area has been reclaimed from the sea by the rapidly growing, confluent leltas of the Waihou and Piako Rivers and their tributaries. (This area s stippled in Fig. 22.) The unfilled, northern portion of the depressed rea is known as the Firth of Thames.

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[28] W. Lindgren: The Hauraki Goldfield, New Zealand, *Eng. and Min. Journ.*, Feb., 1905, p. 261.

[29] J. Henderson: The Geology of the Aroha Subdivision, *N. Z. Geol. Surv. Bull. 16*, 1913.

[30] *Ibid*, pp. 49-51.

Notable recession of the shore-line from the fault at Thames has not taken place, mainly, no doubt, on account of the feebleness of wave action in the landlocked Firth of Thames, and partly on account of the rapidity of sedimentation, though the initial depth of water close to the shore must have been very great, as a bore-hole has been put down to a depth of over 1,100 feet through silt without reaching solid rock.[31]

Northward beyond the fault coast and on the whole eastern seaboard there is a young depressed coast. The latest movement, therefore, of importance in determining the outlines of the Hauraki Peninsula appears to have been a tilt to the north and northeast of a surface of strong relief, maturely dissected in a single cycle, the Thames fault coast forming the western boundary of the tilted area and separating it from the adjacent deeply submerged block. A comparison of Figure 22 with Figure 3 shows that the western coast of the Hauraki Peninsula, as a whole, affords an example of a transition from a fault coast to a depressed coast.

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[31] C. Fraser: The Geology of the Thames Subdivision, *N. Z. Geol. Surv. Bull. 10*, 1910, p. 32.

THE GEOGRAPHICAL FACTOR IN AGRICULTURAL INDUSTRIES*

We have in the middle West, between the 98th meridian and the Rocky Mountains, a stretch of prairie land known as the Great Plains. From the 33rd parallel to the Canadian border the climatic conditions are singularly uniform, and the soil, though varied, is generally very fertile. The one great handicap of the region is insufficient rainfall. The population is sparse and doubtless will continue so, but the transportation facilities are excellent and constantly improving. Roughly speaking, half of our commercial grain crop is produced in that region. Wheat is the chief money crop and should remain so; but the continuous and exclusive production of wheat is out of the question. The labor requirement of the wheat crop covers but a few weeks in the year and the time limits are sharp. Furthermore, continuous wheat production leaves the land weedy and yields decline rapidly. A rotation involving corn on the land once in three or four years obviates this weed trouble and lengthens the labor season by a few weeks. But corn is precarious as a grain crop because of the late summer droughts. These droughts do not affect so seriously the value of corn as a forage crop, but a forage crop is too bulky to justify long shipment to market. Thus we find that if we would have permanent and prosperous agriculture on the Great Plains and continue the production of our share of the world's wheat supply we must establish there some animal industry to utilize the forage incident to the rotation requirements of wheat production and to provide at the same time continuous employment for a larger proportion of the labor needed for the wheat crop.

This is one aspect of the situation. Another view is that west of the Great Plains lie the upland ranges of the Rocky Mountains with their rich summer pastures and sheltered valleys for winter feeding. This is a vast natural breeding ground for livestock. From these ranges the meat animals move eastward across the Great Plains to eastern markets. But the range stock must be fattened for market and they are ''fed in transit,'' as the saying is. Some of this feeding in transit is now done on the Great Plains, and a much larger proportion of it might well be, without reducing, but rather increasing, the wheat output of the region.

Furthermore, within the Great Plains the arable lands are interspersed with non-arable grass-producing lands capable of supporting vast herds of cattle if supplementary and winter feeds are provided. Thus it is clear that if we have a proper understanding of the geographical factors in the situation we can take up more intelligently the task of adjusting the interrelation of a group of associated industries through which we may hope to utilize most efficiently the natural resources of this great section of the country.

We hear, not infrequently, some most pessimistic utterances concerning the outlook for the industry of meat production in the West. We hear that our western range lands have been invaded by the wheat farmer and we must soon look to other countries for an increasing proportion of our meat supply. I feel confident that such fears are unwarranted. The former wasteful and inefficient methods of meat production must be and are gradually being replaced. The live-stock population of our western states is gradually increasing, and this increase may be expected to go on more rapidly in the near future and to continue for many years. The limit of our resources in this direction is not yet in sight. Is it not one of the functions of geographers to make the underlying features of this and similar situations a part of our common knowledge in order that our people may not suffer needless misapprehension, and may act wisely in dealing with the legislative and economic problems involved in the utilization of these resources?

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* This is part of a paper read on April 9, 1915, at the meeting in New York of the Association of American Geographers and the American Geographical Society.

Another illustration of the importance of the geographical factor in agricultural industries may be taken from our western irrigated lands. From the very nature of the case this is a problem in space relations. The aggregate area of our irrigated land in the United States is probably not much in excess of fourteen million acres, or about one-third of the area of the state of Iowa. But these lands are scattered over the entire western half of the country, which is but sparsely populated and can consume but a small proportion of the products of the irrigated land. Both the incoming supplies and the outgoing products must bear heavy transportation charges. Because of the cost of preparing the land for irrigation as well as of the cost of water the farming must be intensive in character, that is, the returns per acre must be relatively high.

The problem of profitable industries for our irrigated lands is rendered difficult because of the barrier of distance. And our irrigation farmers seem slow to grasp the significance of the barrier in relation to every phase of their existence. In the history of almost every irrigation enterprise in the West there has been a period of severe economic depression due to this fact of isolation. When a new section is brought under irrigation the first farmers find a ready local sale for their products at good prices. These prices are based upon the cost of the commodities at distant points plus the transportation charges. As soon as the local production exceeds the local demand the scale of prices automatically falls to a point determined by the cost in outside markets *less* the transportation charges. This looks, of course, like a very simple lesson in geography and one that might be learned by observation. But, as a matter of fact, it has been learned by our irrigation settlers only by experience and sometimes very bitter experience.

One naturally thinks of irrigated land as best adapted to the production of fruit and vegetables. But fruit and vegetables are both heavy and perishable, and in consequence the expense and risk of shipment to distant markets are relatively great. It is only in cases where climate or season give special advantages in a monopoly of the market that these industries become permanent and profitable. I refer to the citrus industry of California and the Bermuda onion industry of southern Texas as examples.

For the most part, the products of our irrigated lands come into direct competition with the products of our non-irrigated lands and must depend upon their somewhat larger yields and greater certainty of production to offset the disadvantage of distance to market. In general, we find that conditions on our irrigated land favor the production of forage crops and grain. Somewhat more than eighty per cent. of our irrigated land is devoted to crops of these two classes. Even with the most favorable transportation conditions, the distance which forage crops can profitably be moved is relatively small.

There are comparatively few instances in which these crops can be grown profitably on irrigated land to be shipped to market. We have, then, the problem of establishing industries to utilize them locally or of replacing them at least in part with other crops which can be shipped to market. Thus we may expect to see our irrigated land play an important part in live-stock production in the West.

As an instance of crop replacement I might mention the establishment of the production of long-staple cotton on the irrigated lands of the Southwest. This product is so high priced that the percentage of its value represented by transporation cost is small.

These instances will serve to illustrate the point that the single geographical factor of space relations is a very potent one in determining the character and relationship of our agricultural industries, especially in the western states.

Carl S. Scofield.

EXPLORATION OF THE RIO ANANÁS, BRAZIL

A real discovery as a result of exploration in new territory always clears up a host of related problems. We have already commented (*Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 216-217) on the good judgment of Colonel Theodore Roosevelt in selecting the unexplored region between the Madeira and the Tapajoz for his Brazilian expedition—a choice which made possible the largest results in the time available. ''Through the Brazilian Wilderness'' makes clear how the mysteries of the hydrography of the region were solved by the discovery of the Rio Theodoro. It is to be expected that one after another of the tributaries will be ''tied up'' with the main river through independent surveys until the whole region has been explored. Fortunately for the later expeditious, the main stream, which is the key to the region, is already laid down upon the map. Further explorations are now reported that outline the drainage of the Ananás, or Pineapple River, and its relation to the Theodoro. The information is conveyed in a letter from Colonel Roosevelt reprinted herewith by his kind permission:

Oyster Bay, Long Island, N. Y.
December 21, 1915

My dear Professor Bowman:

You may be interested in the information I have just received from South America. About a year ago, under the direction of Colonel Rondon, Lieutenant de Souza, with ten *camaradas*, was sent down the Ananás, or Pineapple River, which you will see indicated in my book on the map opposite page 338. The expedition had a very hard time. They soon ran out of food. They had very bad times in the rapids and all of them fell sick. Finally they were attacked by Indians. Lieutenant de Souza fired one shot in the air; then the gun miss-fired. Four arrows struck him. He plunged into the river but was too badly wounded to swim and sank. At the time they were on an island making a canoe to replace one lost in the rapids. The other canoe had been taken over to the bank by two *camaradas* who had gone hunting. Two of the *camaradas* on the island escaped and, traveling through the forests, struck the Dúvida. A third also escaped by himself. He had been out hunting and discovered the Indians before they discovered him. He watched them for seven hours and after they had left he went to the camp, got de Souza's diary and a few other things and then descended the bank of the river into the Dúvida, descending for twenty-four days before he found the first rubber man. He then continued twenty-two days farther on foot before he finally managed to secure a canoe. The Ananás proved to be the Rio Cardosa, which I have marked on the same map. This must mean that the Upper Aripuanan, or Aripuanan proper, is a much shorter river than that branch which we ascended and takes its rise somewhere between this river which we descended and the Canumá.

I am sending a copy of this letter to Mr. Freshfield of the Royal Geographical Society.

Sincerely yours,
[Signed] Theodore Roosevelt.

This letter shows that the Ananás is one of the numerous headwater branches of the Rio Theodoro and not the major tributary which it had been thought it might be. As it coincides with the Cardosa, which empties into the Theodoro in 10° 58′ S., the distance in a straight line from its source, in about 12½° S., to its mouth is about 125 miles. If it had turned out to be the Upper Aripuanan, which empties into the Theodoro in 7° 34′ S., this distance would have been about 400 miles. The Upper Aripuanan is undoubtedly the largest right affluent of the Theodoro. Nevertheless, it should be noted that the ample development of drainage arteries (due to the larger precipitation) on the edge of the Matto Grosso highland makes it just possible that some of these streams form part of the headwaters of the Aripuanan. But the probability is stronger than ever that the river descended by Colonel Roosevelt is the longest continuous waterway within the drainage system of the Rio Theodoro.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

Retirement of Mr. Cyrus C. Adams. On December 3, 1915, Mr. Cyrus C. Adams retired from the staff of this Society after seven years' service as editor of the *Bulletin*, following in turn an earlier connection as editorial contributor dating from 1902. Though he discontinues the arduous duties of editorial management his name will still be found among the list of contributors—we hope for many years to come. His services to the Society have been varied and important, and under his hand the *Bulletin* grew from a slender magazine issued five times a year to a monthly of sixty-four and finally eighty pages.

The growth of the *Bulletin* was due partly to the rapid development of geography in higher education but largely to Mr. Adams' own contributions. The news sense which his journalistic training had developed made itself felt in the timeliness and interest of the items in the "Geographical Record," many of which he wrote himself. Polar exploration and the economic development of new regions, especially Africa, have been his special topics. His early manhood coincided with the heroic age of African exploration, and he read with avidity the accounts of the great travelers. In its pages the *Bulletin* has often reflected the affectionate intimacy of his knowledge of African geography.

One of his aims has been to raise the standards of commercial map-publishing, which were as low as the standards of government cartography are high. To this end he developed the department of "New Maps," aiming to present in it critical reviews of the most important current maps. Akin to this activity was his organization of the exhibit of foreign wall maps and atlases, which circulated among various educational institutions and helped to call the attention of teachers to the effectiveness of these important adjuncts of the text-book.

It is difficult to compress within reasonable limits even an outline of the service he has rendered the Society. It is perhaps enough to conclude that he has been one of the educational factors of the present age of rapid geographical development and has made contributions of lasting importance.

NORTH AMERICA

Our Fur Seals. Two papers on this subject were read at the meeting of the American Association for the Advancement of Science in San Francisco in August last. George Archibald Clark of Stanford University, discussing "Conservation and Utilization of Our Fur Seals," said that the seal herd, which has yielded $26,000,000 to the United States treasury since the transference from Russia in 1867, is now reduced to one-tenth its original size owing to indiscriminate hunting in the open sea of female seals and their offspring. As is well known, pelagic hunting was forbidden by law, and Congress in 1912 also suspended land-sealing, which has involved an annual loss of $500,000 and is detrimental to the seal herd through the overstock of males. The inability of the Treasury Department and later of the Department of Commerce to deal effectively with the problem had been demonstrated. He urged that the management of the seal herd be transferred to the Department of Agriculture, which has experts and facilities necessary to deal with the matter. Mr. W. H. Osgood of the U. S. Biological Survey said in his paper that the fur seals on the Pribilof Islands in 1914 numbered 295,000 seals, of which 93,250 were breeding females. This is an increase of nearly 40 per cent. in two years. It is reasonable to hope that with proper management a nearly or quite complete regeneration of the herd may be effected.

Vulcanism in the Yukon Basin. While Quaternary lavas have been recognized in several localities within the Yukon Basin the most recent vulcanism yet recorded is that first noted, in 1883, by Schwatka, who made observations on the ash deposits of the Lewes River, subsequently defined by the successive studies of Dawson, Hayes, Brooks, and Capps. Mr. Stephen R. Capps (An Ancient Volcanic Eruption in the Upper Yukon Basin, *U. S. Geol. Surv. Prof. Paper 95-D*, pp. 59-64) estimates the area still appreciably affected at 140,000 square miles and the volume of ejected material at about 10 cubic miles, thus placing the occurrence in a category with such classic eruptions as those of Krakatoa (1883) and Katmai (1912). Over large areas the ash appears as a remarkably uniform white layer, entirely sympathetic with the present topography. Apart from sporadic exceptions, explainable by wind action, the layer is single and apparently due to one period of eruption and unaccompanied by lava flows. The sudden and rapid thickening of the deposit to a maximum of 200-400 inches towards the northern border of the St. Elias Mountains locates the source with considerable certainty. The actual vent is not improbably in a small crater recently observed in a glacial cirque four miles north-northeast of Mt. Natazhat. From this locus, and indicating west and south winds during the eruptive period, the ash spread over an extensive area to the east and north. The recency of the eruption is proved by physiographic and botanical data. The rivers have not had time to lower their beds appreciably since the deposition of the ash, and over large tracts the ubiquitous tundra moss has not yet secured a foothold. Hayes gives an actual time limit in his observations on the Klutlan Glacier. The glacier surface, now ash-free save in the terminal moraine, represents a movement requiring at least some hundreds of years. Capps, applying his determinations on the rate of peat growth to accumulations upon the ash, places the date at approximately 1,400 years ago.

Miss Jobe's 1915 Expedition to the Canadian Rockies. During July and August Miss Mary L. Jobe again made an expedition to the ''Mt. Kitchi'' region, which she described in the July *Bulletin* of the Society (Vol. 47, 1915, pp. 481-497, with map, 1:300,000). Accompanied by two guides and one woman and three men companions she followed the same route as on her first expedition from the Grand Trunk Pacific Railway to ''Crescent Lake Pass.'' Thence a new route, on the divide via Sheep Creek Pass and a pass to the Porcupine, was followed to the northeast base of ''Mt. Kitchi.'' Two attempts to climb the peak were unsuccessful, although on the second an altitude within 200 feet of the top was reached. From ''Mt. Kitchi'' the party continued north to Jarvis Pass, Mt. Ida and the head of the Wapiti River, traversing in part unmapped territory. The return route via Sheep Creek, the Muddy Water, Grand Cache, the Sulphur and Big Smoky Rivers also in part crossed untraveled areas. Bearings were taken from numerous higher points and detailed observations were made of the region west of Mt. Ida and at the head of the Wapiti.

The Preservation of American Wild Life. Dr. W. T. Hornaday lectured on this topic in Albuquerque, N. M., on October 19, under the auspices of the University of New Mexico, the Albuquerque Game Protective Association, and the U. S. Forest Service. On his initiative a bill will be introduced at the next session of Congress authorizing the Secretary of Agriculture to take over those parts of the national forests that are not adapted for other purposes and establish in them game sanctuaries where game will be bred and set free from time to time over a period of several decades. Dr. Hornaday is confident that, by this method, American game can be preserved.

A Tree Calendar for the Eastern United States. Mr. George N. Lamb of the U. S. Forest Service has prepared an important chart, or calendar, which shows, for the common trees of the eastern United States, the dates of leafing, flowering, ''in foliage,'' seed ripening, seed falling, and leaf falling (*Monthly Weather Rev., Suppl. No. 2,* 1915). The chart is the result of a compilation of data obtained by observers of the Forest Service and also by individuals working alone. The major activities of plants indicate clearly the advance of the season, for these activities depend upon the interaction of a number of weather elements, e. g., temperature, precipitation, humidity, and evaporation. Trees, being the most conspicuous plants and living for many years, lend themselves to phenological observations. There is thus a large body of available material for study along these lines. The tree calendar will be useful to botanists, especially foresters, and to meteorologists, and will also have interest for intelligent observers of plant growth. The botanical range of the various trees is given, and a bibliography is included. Copies of this chart might well be framed and hung on the walls of our schools. Interest in outdoor observation would certainly be stimulated by this means, and comparative observations, made each year by the scholars, of the critical stages of tree development, might well be recorded and kept on file with the chart. The Weather Bureau is doing good work in publishing such a contribution. R. DeC. Ward.

Water Power in the Cascades. The U. S. Geological Survey in coöperation with the Washington State Board of Geological Survey has completed its survey of the water resources of this area (F. F. Henshaw and G. L. Parker: Water Powers of the Cascade Range, Part II, *U. S. Geol. Surv. Water-Supply Paper 313*). This report deals chiefly with the drainage basins of the Cowlitz, Nisqually, Puyallup, White, Green, and Cedar Rivers. The streams of the Cascades have the requisite characteristics for the successful development of water power, viz., steep gradient, abundant water, and comparatively uniform flow. The enormous resources of timber, metals, and lands as yet undeveloped will make the water power of this region very valuable.

The First Year of the Panama Canal. The *Canal Record* (end of August, 1915) analyzes the business of the Panama Canal for the first year of its commercial operation ending on August 14, 1915. During the year 1,317 vessels of 4,596,444 net tonnage passed through the canal. The number of vessels passing from the Pacific to the Atlantic was 661, while 656 vessels passed from the Atlantic to the Pacific. The tolls earned during the year amounted to $5,216,149. The total tonnage of the principal commodities passing through the canal up to July 1, 1915, was as follows: nitrates, 651,948; sugar, 298,864; coal, 286,564; refined petroleum, 252,428; wheat, 230,222; iron and steel manufactures, 202,202; iron ore, 86,104; raw cotton, 48,846; canned goods, 46,998; cacao, 26,928.

Vessels of fifteen nations passed through the canal: American vessels, 481; British, 464; Norwegian, 41; Chilean, 35; Danish, 24; Swedish, 18; and the Dutch, Japanese, Russian, Peruvian, French, Honduran, Italian, Nicaraguan, and Panamanian marine made up the remainder.

About four and one-half times as much tonnage went through the Suez Canal in 1914 as went through the Panama Canal during the first year of its operation. The number of ships using the Suez Canal was about three and two-fifth times as many as used the Panama Canal. The total receipts at Suez were four and five-eighth times the amount of tolls earned by the Panama Canal during its first year.

Suspension of Traffic in the Panama Canal. A serious slide occurred in the canal at the Gaillard Cut (formerly called the Culebra Cut) on September 5 and another on September 18 north of Gold Hill on the east bank. The mass almost entirely filled the channel so that the earth showed above the water where ships ordinarily pass. It was of course necessary to suspend traffic. By the end of December, however, a channel had been dredged large enough to admit of large vessels. According to the ''Official Handbook of the Panama Canal, 1915'' (p. 46), the slides in the Gaillard Cut up to February 1, 1915, have required 35,158,225 cubic yards of additional excavation. To that date the total excavation from the cut had been 117,077,044 cubic yards. Gaillard Cut forms the passageway between the opposite slopes of the continental divide. It is 8 miles long, 300 feet wide at the bottom and from 45 to 65 feet in depth. The great depth of the cut is responsible for the magnitude of the slides, which are breaks in the banks due to the pressure of the material.

SOUTH AMERICA

Condition of the Pan-American Railroad between Buenos Aires and Lima. The well-known project of a continuous railroad system connecting North and South America (cf. reports of the Intercontinental Railway Commission, 4 vols., with 3 map cases, Washington, 1895-98), while not being carried out as a unit undertaking, is approaching realization through the normal development of the railroad systems in the various countries concerned. A note in *Weltwirtschaft* for October, 1915 (p. 146), calls attention to the near state of completion of the line between Buenos Aires, Argentina, and Lima, Perú. Of the whole distance of 2,690 miles, 1,904 miles, or 70 per cent., are completed, and 282 miles are under construction; of the remaining 504 miles, 62 are surveyed and 442 not yet surveyed. The condition of the line, proceeding from south to north, is as follows: Buenos Aires to La Quiaca, on the Argentine-Bolivian boundary, completed, 1,088 miles; La Quiaca to Tupiza, surveyed, 62 miles; Tupiza to Uyuni, under construction, 127 miles; Uyuni via Oruro and Viacha to Guaqui, near the Peruvian-Bolivian frontier, completed, 360 miles; Guaqui to Puno, reconnaissance survey, 99 miles; Puno to Cuzco, completed, 238 miles; Cuzco to Ayacucho, unsurveyed, except for a short section beyond Cuzco, 340 miles; Ayacucho to Huancayo, under construction, 162 miles; Huancayo, to Lima, completed, 214 miles. Lima is not strictly on the intercontinental line, which passes through Oroya, 128 miles inland from Lima. A northerly continuation is already completed to Cerro de Pasco, 83 miles beyond Oroya.

EUROPE

Discovery of a Substitute for Chilean Nitrate of Soda in Germany. A pamphlet recently issued by the German government announced that agriculture in Germany would not suffer from the inability at present to procure Chilean nitrate of soda, because a satisfactory substitute for this fertilizing element had been discovered. The announcement seems to have been based upon Professor Gerlach's report to the German Agricultural Society of Berlin, on September 18, of the discovery that both sulphate of ammonia and cyanimide will supply a satisfactory substitute for nitrate of soda. Experiments had shown, he said, that sulphate of ammonia produces on an average 89 per cent. of the effect of nitrate of soda, and cyanimide 75 per cent. He estimated the production of cyanimide in German factories at 120,000 tons yearly. German farmers, he added, must use nitrogen fertilizers liberally since it returns six-fold its weight in highly digestible albumens.

PHYSICAL GEOGRAPHY

Truncation of Spur Ends by Glacial Erosion. Mr. P. G. Morgan, director of the Geological Survey of New Zealand, calls attention to the following early recognition, in 1866, of the truncation of spur ends in valleys formerly occupied by glaciers. The extract is from an article "On the Formation of Lake-Basins in New Zealand," by W. T. Locke-Travers, in the *Quarterly Journal of the Geological Society* of London, Vol. 22, 1867, p. 258:

"I will now mention the facts observed by me in the valleys of the Dillon and Clarence, as these valleys present features of exceeding interest in connection with former glacial action. As a general rule in this country [New Zealand] in valleys which have never been occupied by glaciers, the spurs of the ranges on each side interlock; whilst in those which have been occupied by glaciers we constantly find the points of the spurs on one side or other of the valley cut off, the faces of the spurs then being Λ-shaped, and rising at a very steep angle. I have observed the latter feature to obtain in all the valleys in which I have found old moraines, and I think it may be a good guide in determining the longitudinal extent of former glacier action."

Mr. Morgan adds that Travers subsequently wrote several other papers dealing with glaciation in New Zealand (see *Trans. New Zealand Inst.*), but I do not think he ever repeated the lucid statement quoted above; much less did he enlarge on it.

W. M. Davis.

Torrents and Floods. Geographers will find an interesting account of the work of torrents and floods, with citations from many sources, in an important geological work entitled "Formation of Coal Beds," by J. J. Stevenson, originally printed in the *Proceedings of the American Philosophical Society* of Philadelphia for 1911, 1912, and 1913, and now issued as a separate volume of 530 pages. The protective effect of vegetation against erosion is illustrated by examples from the White Mountains, the southern Appalachians, France, and elsewhere. River floods are discussed with especial reference to their power of uprooting forests, and with the conclusion that no floods are strong enough to uproot trees, except where they are undermined along a river bank. The source and distribution of driftwood are described, especially on Arctic shores. Peat deposits are treated in much detail, but rather from a geographical than from a botanical point of view. All these and many other matters are considered in order to obtain a present-day observational basis for the explanation of coal deposits. The opinion reached is that "coal beds and the associated rocks are of land origin; the detrital deposits are those made by flooding waters on wide-spreading plains; the coal beds, in all essential features, bear remarkable resemblance to peat deposits" (p. 506).

W. M. Davis.

Recent Studies of Atmospheric Radiation. Dr. Anders Ångström of Upsala was a member of the Smithsonian Astrophysical Observatory expedition which, in 1912 and 1913, in Algeria and in California, made observations of the radiation of the sun. Dr. Ångström's report appears as Vol. 65, No. 3, of the *Smithsonian Miscellaneous Collections* (1915). The author finds, among other results, that the variations of the total temperature of the atmosphere are at low levels (below 4,500 meters), principally caused by variations in temperature and humidity, and that the total radiation from the atmosphere is nearly proportional to the fourth power of the temperature at the place of observation. An increase in the water-vapor content of the atmosphere increases its radiation, and an increase in the water-vapor pressure causes a decrease in the effective radiation from the earth to every point of the sky. There is no evidence of maxima or minima of atmospheric radiation during the night that cannot be explained by the influence of the conditions of temperature and humidity. Daytime radiation seems to be subject to the same laws that hold for nocturnal radiation. The effect of clouds is very variable, depending upon their altitude and their density. Nocturnal radiation was reduced by the Katmai dust by less than 3 per cent. It appears, therefore, that the effect of haze upon the effective radiation to the sky is almost inappreciable when no clouds or fog are formed.

R. DeC. Ward.

Sunspots and Rainfall. The question of the relation of sunspots and rainfall is considered by Dr. Gilbert T. Walker, Director-General of Indian Observatories, in Vol. 21, Part 10, of the *Memoirs of the Indian Meteorological Department.* The data of annual rainfalls at isolated, representative stations all over the world are examined for periods which, in general, do not go back of 1850. The results are presented in tabular form and are also charted, the coefficients being given to the nearest .05. To quote the author, the impression left by an examination of the chart "may be one of disappointment at the comparative insignificance and inconsistency of the results." It appears that the coefficient of rainfall with sunspots is not, in general, much larger than would result from chance. Where the coefficients have an appreciable tendency towards uniformity, a real relationship may be inferred. This relationship seems real in the cases of the Nile and India. The clearest case is South America. Below lat. 30° S. the rainfall is deficient when sunspots are numerous. A full discussion of the problem is to be postponed by the author until a later date. R. DeC. Ward.

Volcanic Dust and Climatic Variations. Mr. Henryk Arctowski's important studies of temperature variations and their correlations are being continued, with further interesting results. The most recent paper (*Annals N. Y. Acad. Sci.*, Vol. 26, 1915, June 21, pp. 149-174) takes up the question of the possible effect of volcanic dust upon terrestrial temperatures, a subject to which W. J. Humphreys, C. G. Abbot, F. E. Fowle, and H. H. Kimball, in this country, have lately paid attention. The problem was to ascertain, if possible. whether temperature variations are due to terrestrial causes, as in the case of volcanic dust veils, or to cosmical causes. The temperatures at a considerable number of stations are plotted for the years before, after, and also including, the Krakatoa, Mont Pelé, and Katmai eruptions. Curves are drawn showing the world's mean temperatures and the variation of frequency of volcanic eruptions (ten-yearly totals). The discussion of the relation of sunspots and atmospheric temperature is considered briefly. The author concludes that the Krakatoa dust veil very greatly affected temperature, but that the eruptions of 1902 and the Katmai eruption of 1912 had a very slight effect, if any, upon the mean annual temperatures. The "pleionian" variations of temperature have nothing in common with the presence or absence of dust veils. There is a presumption in favor of a correlation between "pleionian" and "macropleionian" (long range) variations of temperature and volcanic eruptions. As yet, however, there is difficulty in imagining how such a correlation could be explained. R. DeC. Ward.

GEOGRAPHICAL NEWS

A New Series of Regional Geographies. Under the editorship of Professor Vidal de la Blache, the dean of French geographers and a recent Charles P. Daly medalist of the Society, a new series of regional geographies is to appear bearing the imprint of Armand Colin, Paris. The series, which will be entitled "Géographie Universelle" and comprise twelve volumes, will embody the most advanced methods in the presentation of regional geography. Unlike the classical prototype from which it derives its name, Reclus' survey of world geography in nineteen volumes, it will be written by a number of specialists. Although the detailed list is not yet available, the following contributors may be mentioned: Henri Baulig, North America or the United States; Albert Demangeon, the British Isles; Augustin Bernard, North and West Africa; and Jean Brunhes, the Mediterranean and the Mediterranean countries of Europe. Publication was to begin, it was hoped before the war broke out, toward the end of 1915.

Change of Title of "Popular Science Monthly." Beginning with the October number, *Popular Science Monthly* has changed its title to *The Scientific Monthly*. Its character, editorial management, and typographical appearance will remain the same. The change has interrupted the final volume (87) of *Popular Science Monthly*, which would ordinarily have extended from July to December. Thus at least one series of articles continues in the new volume. The October number of *The Scientific Monthly* is designated Vol. 1, No. 1. The Science Press continues to be the publisher. The old title has been assumed by a—literally—popular magazine of applied science heretofore called *World's Advance* and edited by a former managing editor of the *Scientific American*.

A Memorial of Professor Tarr. A granite boulder has been placed on the campus of Cornell University as a memorial of the late R. S. Tarr, professor of geology and physical geography at the university from 1892 to 1912. A bronze tablet will be set into the boulder inscribed: "Ralph Stockman Tarr, 1864-1912. Scientist—Writer—Teacher. This boulder, a relic of the Ice Age, symbolic of his research in glacial geology and of the enduring value of his work, is placed here as a memorial of their friend and adviser by his students."

PERSONAL

MARQUIS CAPPELLI has resigned the presidency of the Royal Geographical Society of Italy.

PROFESSOR HENRY C. COWLES, of the University of Chicago, lectured before the Geographic Society of Chicago, on October 8, on "Romance and Reality from the Mississippi Bottom Lands."

PROFESSOR ELIZABETH F. FISHER of Wellesley College is giving two courses of lectures in the Teachers' School of Science (Lowell courses in the university extension), Boston, one on "The Physical Geography of the Lands" based on concrete examples, attended by sixty students, and the other on "The Economic and Historical Geography of Greater Boston," attended by eighty students.

DR. W. T. GRENFELL will spend the winter in the United States and Canada making a transcontinental lecture tour to raise funds for his Deep-Sea Mission in Labrador. .

DR. SVEN HEDIN has been elected a corresponding member of the Royal Academy of Sciences in Vienna.

DR. ELLSWORTH HUNTINGTON has been awarded the Elisha Kent Kane medal of the Geographical Society of Philadelphia. After the presentation, on November 3, Dr. Huntington lectured before the society on "Climate, Weather, and Daily Life."

PROFESSOR THEODOR KOCH-GRÜNBERG has been appointed scientific director of the Museum für Länder- und Völkerkunde in Stuttgart.

OBITUARY

COLONEL SIR CLAUDE M. MACDONALD died in England of heart failure on September 10, aged 63. While best known as a diplomatist, he did geographical work of distinct value, when, in 1887-88, he made a voyage up the Benue tributary of the Niger, whose upper course and affluents were imperfectly known. He was the first to map the Mayo Kebbi, the northeastern branch of the Benue, which he ascended in a small steamer. He thus revealed the navigable stretch of that river; but it was reserved for the French explorer Captain Lenfant later to trace the remarkable water connection which the Mayo Kebbi forms between the Benue basin and the basin of Lake Tchad.

DR. CHARLES FREDERICK HOLDER, the naturalist and author, known for his books on marine zoölogy and related subjects, died at his home in Pasadena, Cal., on October 11, aged 64 years. He was a voluminous author. Among his works were Elements of Zoölogy, 1885; Stories of Animal Life, 1900; Game Fishes of the United States, 1913; Game Fishes of the World, 1913.

DR. EMIL RUDOLPH, honorary professor of geography in the University of Strassburg, has died at the age of 61 years.

PROFESSOR PAUL STANGE, geographer in the government service of Chile (1890-1898), has died in Germany, aged 54 years. While in Chile he was associated with the explorations of H. Steffen and P. Krüger in the Chile-Argentine boundary region of the Patagonian Andes. He published in 1914 his "Landeskunde von Chile," reviewed in the October *Bulletin* of the Society (Vol. 47, 1915, p. 783).

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

Explanatory Note

Beginning with the present number, a change is made in the arrangement of the bibliographical section. In the *Bulletin of the American Geographical Society* the publications listed each month were divided into four sections, mainly according to physical form, and each section was then subdivided by regions or subjects, whereas in *The Geographical Review* all publications will be listed under one department, in which the regional and subject classification will be the main principle of subdivision.

Under the caption "Brazil," for example, will be found together all the references on that region, whether reviews or titles of books, papers, or maps. Within each regional or subject division come: first, reviews of books, papers, and maps; second, titles of books and papers; and, third, titles of maps; the items within the first and second groups being listed alphabetically according to author or, where anonymous, according to the characteristic word of the title. The map titles constituting the third group follow no special arrangement, but they are distinguished by a different style of type. Groups two and three, while mainly consisting of titles only, are occasionally supplemented by short comment. The size of books is given in inches to the nearest half inch.

With regard to the bibliographical department in general, it should be understood that the publications listed are not necessarily all distinctively geographical in treatment, though all are to be of geographical interest or to contain material for the geographer.

A synopsis of the scheme of regional and subject classification is given below. Although the logical sequence would be first to take up the subdivisions of general geography and then those of regional geography, it has been thought wiser to begin with the regional classification in view of the greater general interest in this phase of geography and the greater number of publications dealing with it. Similarly, the regional takes precedence over the general classification. A paper on the climate of Brazil would thus be listed under "Brazil" and not under "Meteorology and Climatology."

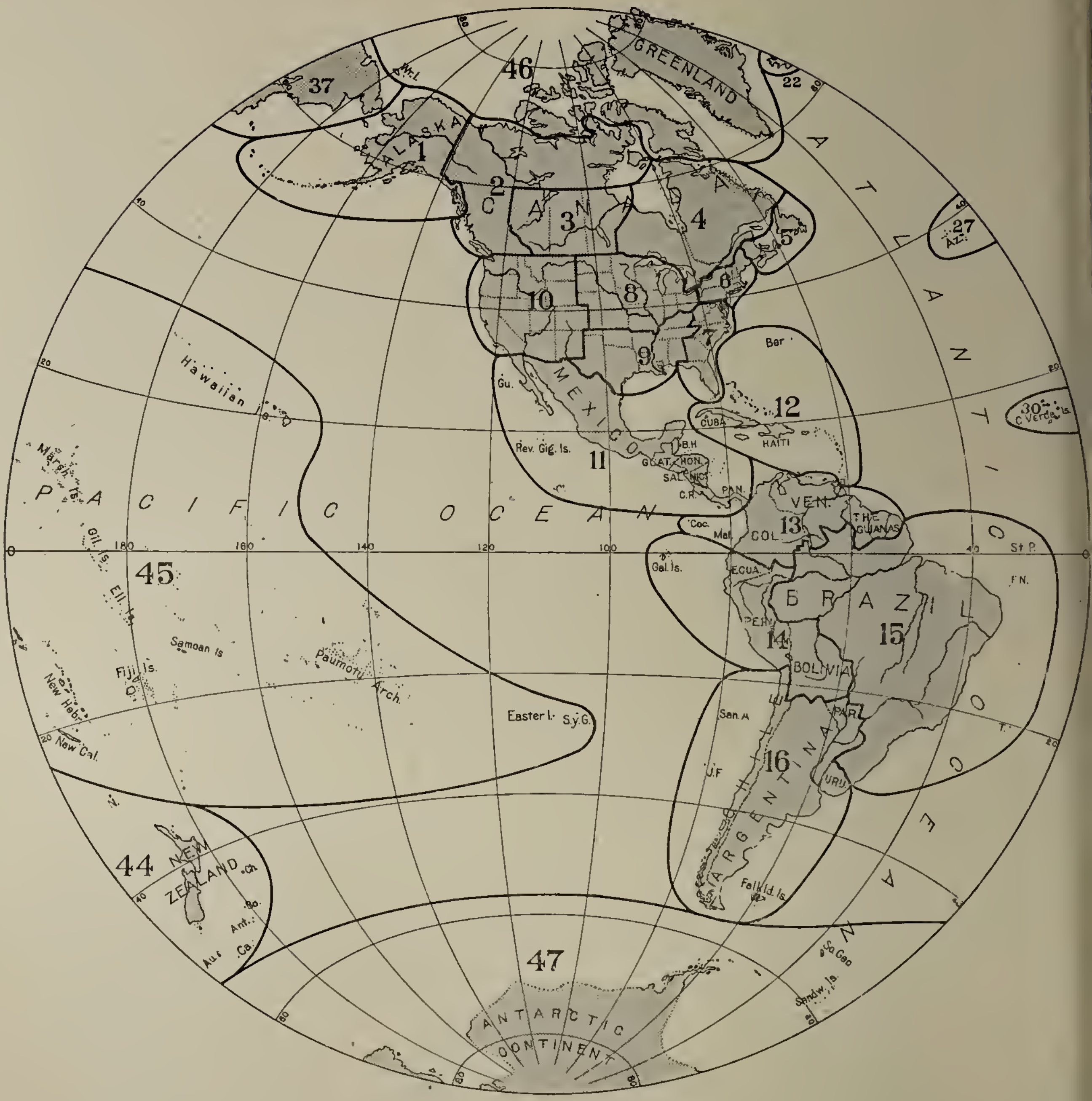
The classification of general geography aims to subdivide its main divisions into their constituent parts. The subjects included under the headings used will appear from the explanatory column of the synopsis. Only publications dealing with the principles of geography, and not with their application to definite regions, are listed in this section, as, for example, papers on the population density of industrial districts or on desert vegetation.

In the regional classification the thought has been to create divisions that are broadly homogeneous and to adjust the size of each division to its importance in geographical literature. In some cases this has led to the grouping of several countries together; in others to the retention of a single country as a division by itself; and in still others, as in the case of the United States and Canada, for obvious reasons, to the subdivision of a country into smaller units. Although political areas have on the whole been the units used, in some cases, as for Africa and India, it has been necessary partly to disregard these in order not to break up related regions. The divisions are enumerated as far as possible in their natural order, beginning with the western hemisphere, so that contiguous areas may follow one another.

About fifty divisions have been established. They are enumerated in the synopsis below and outlined on the adjoining map of the world in two hemispheres, on which the numbers correspond with those in the synopsis. The boundaries on the map refer only to the land areas which they enclose. Areas included in a division but not expressed in the heading used for it, such as detached islands, are indicated in the explanatory column of the synopsis.

All publications are classified according to the division with which they predominantly deal. A map of Europe and the Near East would thus be listed under "Europe;" a paper on the climatic basis of vegetational distribution, under "Phytogeography and Zoögeography."

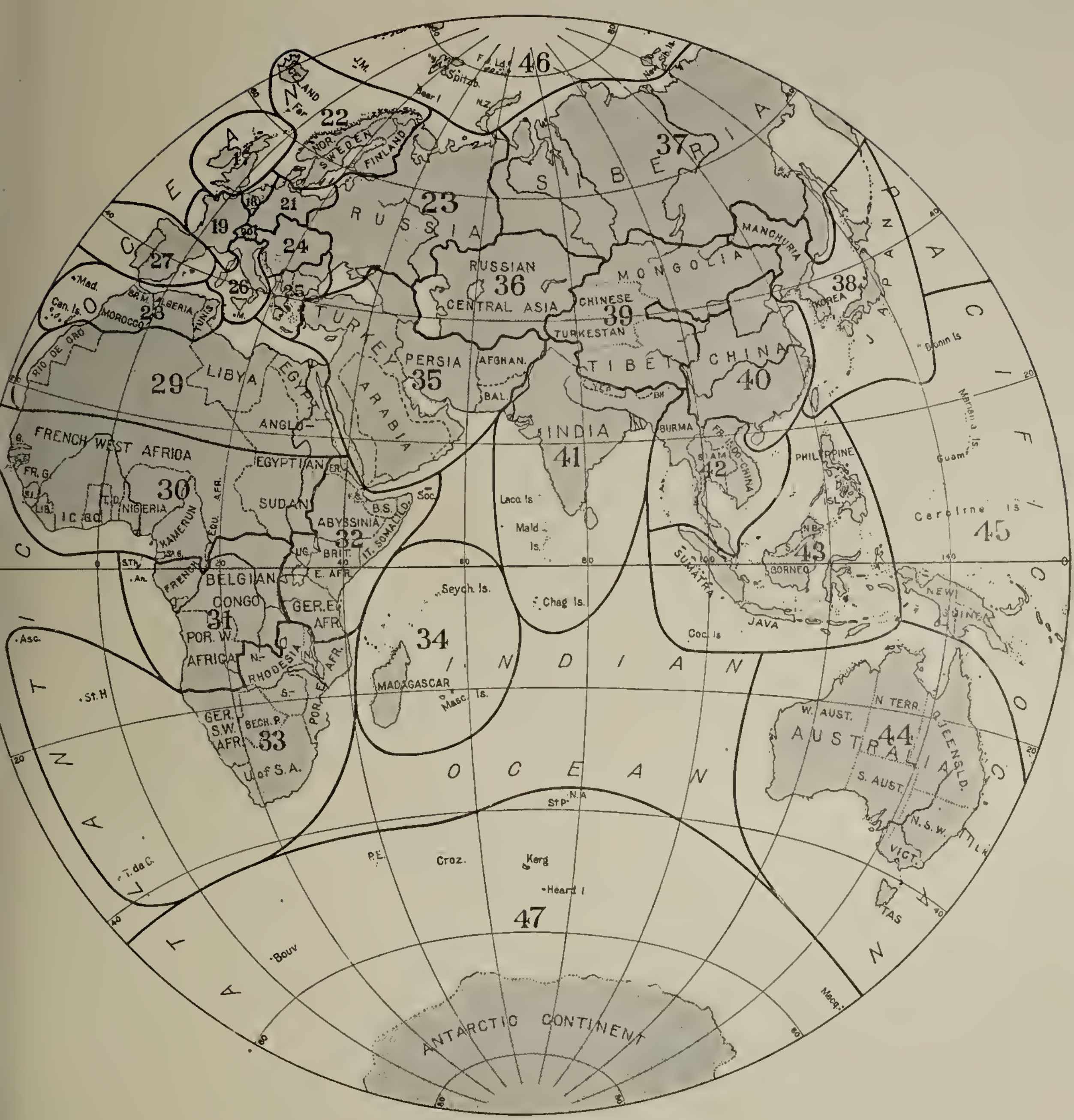
All divisions of the classification will not necessarily be represented in each issue.



SYNOPSIS OF CLASSIFICATION

Regional Geography

Titles of Headings	*Other Areas Included*
NORTH AMERICA	
General	
1 Alaska	
Canada	
General	
2 Yukon, Northwest Territories, British Columbia	Southampton I., Coats I.
3 Alberta, Saskatchewan, Manitoba	
4 Ontario, Quebec	Labrador coast, Mansel I.
5 Maritime Provinces, Newfoundland	



Titles of Headings	*Other Areas Included*
North America (continued)	
United States	
General	
6 North Atlantic States	
7 South Atlantic States	
8 North-Central States	
9 South-Central States	
10 Western States	
11 Mexico and Central America	Panama; Gaudalupe I., Revilla Gigedo Is., Clipperton I.
12 West Indies	Bermuda; Curaçao, Aruba, Buenayre, Trinidad, but not Venezuelan coastal islands

Titles of Headings	*Other Areas Included*
SOUTH AMERICA	
General	
13 The Guianas, Venezuela, Colombia	Cocos I., Malpelo I.
14 Ecuador, Peru, Bolivia	Galápagos Is.
15 Brazil	Fernando Noronha I., St. Paul I., Trinidad I.
16 Paraguay, Uruguay, Argentina, Chile	San Ambrosio I., Juan Fernandez I., Falkland Is.
EUROPE	
General	
17 British Isles	Channel Is.
18 The Low Countries, Luxemburg	
19 France	
20 Switzerland, or the Alps	
21 Germany	
22 Scandinavia, including Finland	Iceland, Faroe Is.
23 Russia	
24 Austria-Hungary	
25 Balkan States, including Rumania	
26 Italy	Malta
27 Spain, Portugal	Azores
AFRICA	
General	
28 Atlas Region	Madeira, Canary Is.
29 Sahara, including Egypt	
30 Sudan and Upper Guinea	Cape Verde Is., Fernando Po
31 Congo Basin and Lower Guinea	S. Thomé and Principe Is., Annobon I.
32 East Africa	Socotra I.
33 South Africa	Ascension I., St. Helena, Tristan da Cunha, Gough I.
34 Madagascar and Adjacent Islands	Comoro Is., Amirante Is., Seychelles Is., Mascarene Is.
ASIA	
General	
35 Turkey in Asia, Arabia, Caucasia, Iran	Cyprus (Iran=Persia, Afghanistan, Baluchistan)
36 Russian Central Asia	=General Government of the Steppes, General Government Turkestan, Bokhara, Khiva
37 Siberia	
38 Manchuria, Korea, Japan	
39 Mongolia, Chinese Turkestan, Tibet	
40 China	
41 India	Ceylon, Laccadive Is., Maldive Is., Chagos Is.
42 Farther India, including Burma	Andaman Is., Nicobar Is.
43 Malay Archipelago, including the Philippines	Cocos Is.
AUSTRALASIA AND OCEANIA	
General	
44 Australia, New Zealand	Norfolk I., Lord Howe I., Chatham Is., Bounty Is., Antipodes Is., Auckland Is., Campbell I.
45 Melanesia, Micronesia, Polynesia	
POLAR REGIONS	
General	
46 Arctic	American Arctic Archipelago
47 Antarctic	Amsterdam I., St. Paul I., Kerguelen I., Heard I., Crozet Is., Prince Edward Is., Bouvet I., South Georgia, Sandwich Is., Dougherty I., Macquarie I.
OCEANS	
WORLD AS A WHOLE AND LARGER PARTS	

General Geography

Titles of Headings	*Subjects Included*
MATHEMATICAL GEOGRAPHY	
General	
Astronomical Geography	Orientation on the celestial sphere; rotation and revolution; time
Surveying and Geodesy	Navigation; size and shape of the earth
Cartography	Projections; map content; cartometry; globes and relief models
PHYSICAL GEOGRAPHY	
General	
Geophysics	Density; condition of the interior; determination of gravity; terrestrial magnetism; atmospheric electricity
Geology and Geomorphology	Seismology
Hydrography and Oceanography	Potamology; limnology
Meteorology and Climatology	Phenology; aërology
Phytogeography and Zoögeography	
HUMAN GEOGRAPHY	
General	
Anthropology and Ethnology	
Anthropogeography	Population and population density; history of settlement; city geography
Economic Geography	Natural products; agriculture; commerce; transportation
HISTORY OF GEOGRAPHY AND EXPLORATION	Historical geography
EDUCATIONAL GEOGRAPHY	Methodology

NORTH AMERICA

GENERAL

DUNBAR, SEYMOUR. **A History of Travel in America**, showing the development of travel and transportation from the crude methods of the canoe and the dog-sled to the highly organized railway systems of the present, together with a narrative of the human experiences and changing social conditions that accompanied this economic conquest of the continent. Vol. 1: li and 339 pp. Vol. 2: pp. 340-740. Vol. 3: pp. 741-1124. Vol. 4: pp. 1125-1529. Maps, ills., index. The Bobbs-Merrill Co., Indianapolis, 1915. $10 for 4 vols. 9 x 6½.

A somewhat ambitious and, on the whole, successful attempt to unfold an important phase of American history which is peculiarly dependent on geography. The dependence may, however, be called mutual, for neither physical nor human geography can make a bare survey of what is; it must view the surface in its making and the human relations to the earth in their evolution.

The author has attempted in these volumes to interpret travel movements in their deeper social meaning and has introduced a mass of social data whose relation to the main theme is not always obvious.

The style in detail is clear, the use of sources thorough, and the narrative vigorous and interesting, though the organization of the material often leaves something to be desired. There are, also, mechanical reasons which throw a certain measure of obscurity on the forward movement of the work.

The first volume brings the story down through a series of first attempts at steamboats. It is thus naturally devoted to matters of a primitive sort, giving a vivid picture of the difficulties of the American wilderness, the making and use of the earliest canoes, barges, and sailing boats, and the transforming of Indian trails into rough roadways.

Volume 2 carries the narrative from Fulton and the *Clermont* through the construction of the National Road and to the final consignment, under Jackson, of parts of the road to the several states. The last chapters of the first volume and the opening chapters of the second offer a full and fascinating account of primitive steam navigation. Several chapters, making the body of the second volume, deal with the acquirement from Indian owners of routes of travel leading through the old Northwest between the Ohio River and the Great Lakes, also through the Southern States east of the Mississippi. For most readers this section seems overextended and parts of it irrelevant.

The author seeks to give the rough social and domestic background of travel and has a scent for a good story so keen as to lead him now and then to a rather gossipy diffuseness. This tendency is illustrated in Chapter 31. Chapters 34 to 46 make up the third volume. They deal with stage coach travel, with the early canal period, to which are given three full and illuminating chapters, and to the early railroads, which fill the greater part of the volume.

The concluding volume finds its theater between the Mississippi River and the Pacific Ocean, ''the overrunning of the West,'' with further stories of Indian relations, the various routes across the plains and mountains, the Mormon pilgrimage, the ''cry of gold,'' and the consummation of Pacific railroad projects. The closing chapter attempts to sketch, in the light of their meaning, the conditions of today.

As to certain phases of book-making: The preface is rather labored and does not succeed in revealing in any sharp fashion the aim of the work. Volume 1 gives the contents of the fifty-eight chapters of the whole series, but in syllabus form and without distinctive chapter titles. The title of the work is used as running-head on both left and right pages. These conditions of mechanical structure make it impossible to get a bird's-eye view of the subject-matter or to tell readily where one thing ends and another begins.

The same defect in perspicuity characterizes the appendices, thirteen in number, and the final index. This index covers forty-five pages and is evidently made with great and conscientious labor, but follows an analytic method which is doubtless clearer to the author than to the reader, offering, in fact, but an obscure clue to the contents. Who, for example, would think of the word, ''Attitude—of White Americans,'' for considerations of the utmost variety, filling nearly two pages? Again, if a name be sought of some celebrity, the reader must learn that it will be found under the head of ''Individuals.'' Three solid and bewildering pages of titles appear under the head of ''Pioneer life of Caucasians.''

There is profuse illustration,—some four hundred views, mainly from old cuts and engravings, including some full-page representations in color. Print and paper are attractive, and, despite defects, the work is important and deserving of hearty welcome.

A. P. Brigham.

Alaska

Jones, L. F. **A Study of the Thlingets of Alaska.** 261 pp. Ills., index. Fleming H. Revell Co., New York, 1914. $1.50. 8 x 5½.

Written by a missionary of more than twenty years' experience among the Thlingets, this book is instructive, sane, simple, and clear. The following topics are treated with authoritative data: environment, origin of Alaskans, Thlinget language, family, community, clothing and ornaments, industries, basketry, foods, customs (extinct, waning, and present), mortuary rites, shamanism, totemism, legends, jurisprudence, amusements, morality, diseases, religion, and education.

The Thlingets are coastal and largely insular people. They are sea-faring men whose main food supply comes from the water. Fish ''is the most abundant and most easily procured of all foods in Alaska.'' The chapter entitled ''Traits'' is particularly analytical. According to Jones the outstanding characteristics of the Thlingets are independence, vanity, sensitiveness (especially noteworthy in personal or property comparisons), jealousy, craftiness, and politeness. The native is not avaricious; on the contrary, he is an extravagant spendthrift. He is childlike in fickleness, undemonstrative before white strangers, but very demonstrative among his own people. He possesses great physical endurance, has intense, though ephemeral, grief, is very affectionate, hospitable, and social. Many natives are sunny and abound with wit and humor. They are expert in powers of detailed observation and in judgment of men.

The chapter on ''Totemism'' is important. ''The totem pole is but one of the many expressions of totemism. Everything the native possesses, in many instances, even his person, carries totemic designs. . . . Totemism is recorded history, genealogy, legend, memorial, commemoration, and art.''

Any student of primitive culture or of aboriginal Americans will be profited by reading Mr. Jones's book. Those who are at times discouraged by the slow development of the American Indian will be gratified at the hopeful facts of more noteworthy advancement among the Thlingets.

A. E. Jenks.

BROOKS, A. H. **The Alaskan Mining Industry in 1914.** Map. *U. S. Geol. Surv. Bull. 622,* pp. 15-68. 1915.

BROOKS, A. H. **The Future of Gold Placer Mining in Alaska.** *U. S. Geol. Surv. Bull. 622,* pp. 69-79. 1915.

BROOKS, A. H., AND OTHERS. **Mineral Resources of Alaska: Report on Progress of Investigations in 1914.** 380 pp. Maps, ills., index. *U. S. Geol. Surv. Bull. 622.* 1915.

CANADA

General

STEELE, S. B. **Forty Years in Canada: Reminiscences of the Great North-West, With Some Account of His Service in South Africa.** Edited by M. G. Niblett. xvii and 428 pp. Ills., index. Dodd, Mead & Co., New York, 1915. 8½ x 5½.

In the past forty years a large part of western Canada has been won from the wilderness. Until 1870, or even later, this was a region unknown to the outside world, and, on theoretical grounds, much of it was believed to be entirely unadapted for settlement by white men, because of a too rigorous climate. Some far-seeing Canadian statesmen and business men, however, recognized the future possibilities of western Canada. Consequently, a campaign of development was gradually organized including the building of the Canadian Pacific Railway. This line, though not completed until 1885, blazed the trail for the immigrant. Settlers have continued to pour in, with the result that the former home of the Indian, the trapper, and the buffalo is now the scene of prosperous cities and towns, of grain fields and elevators. The author was identified with the evolution of western Canada. He had no small part in the events which have made the history of Canada. His book will appeal to a wide range of readers, including students of history, geography, anthropology, and sociology. Many detailed accounts are given of the customs, ceremonies, and life of the Indians, and there are numerous descriptions of frontier life in general. AVARD L. BISHOP.

—— **Forest, Fishery, Fur, and Mineral Production.** Fifth Census of Canada, 1911: **Vol. 5.** 171 pp. [In English and French]. Census and Statistics Offices, Ottawa, 1915.

—— **Geographic Board of Canada: Decisions, July-October, 1915.** 4 pp. Extract from *The Canada Gazette,* Oct. 30, 1915. Ottawa, 1915.

HOOKER, ARTHUR, edit. **Official Proceedings of the 21st International Irrigation Congress Held at Calgary, Alberta, October 5-9, 1914.** 402 pp. Maps, ills., index. Irrigation Branch, Dept. of the Interior, Ottawa, 1915. [Papers on colonization and on agricultural, technical, administrative, and other problems of irrigation in the interested sections of Canada and the United States.]

Alberta, Saskatchewan, Manitoba

DOWLING, D. B. **The Cretaceous Sea in Alberta.** Maps. *Trans. Royal Soc. of Canada,* Series 3, 1915, Vol. 9, Section 4 (Geol. & Biol. Sci.), pp. 27-42.

Explored routes in the lower parts of the drainage area of Churchill and Nelson Rivers, Manitoba and Saskatchewan: geology and geography. 1:1,013,760. Map 58A, to accompany *Geol. Surv. of Canada Memoir No. 30,* by Wm. McInnes. [Ottawa], 1914.

Ontario, Quebec

MILLER, W. G., AND C. W. KNIGHT. **Revision of Pre-Cambrian Classification in Ontario.** Map. *Journ. of Geol.,* Vol. 23, 1915, No. 7, pp. 585-599.

UNITED STATES

General

BLINK, H. **De Vereenigde Staten als industrieland.** Diagrs. *Tijdschr. voor Econ. Geogr.,* Vol. 6, 1915, No. 10, pp. 394-407. The Hague.

D'ESTOURNELLES DE CONSTANT, P. H. B. **America and Her Problems.** xxii and 545 pp. Ill., index. The Macmillan Co., New York, 1915. $2. 8 x 5½.

—— **Roads and Bridges, Construction and Maintenance of, from July 1, 1913, to December 31, 1914.** 64 pp. *U. S. Dept. of Agric. Bull. No. 284.* 1915.

[Set of 11 climatic charts of the United States.] 1:11,875,000. Lowest temperatures ever observed; highest temperatures ever observed; average annual number of days with precipitation 0.01 inch or more; normal July temperature; normal January temperature; normal annual temperature; mean relative humidity, July, 8 A. M.; mean relative humidity, July, 8 P. M.; mean relative humidity, January, 8 P. M.; mean relative humidity, January, 8 A. M.; normal annual precipitation. Dept. of Agriculture, Washington, [1915].

North Atlantic States

HALE, L. C. **We Discover New England.** Drawings by Walter Hale. 314 pp. Map. Dodd, Mead & Co., New York, 1915. 9 x 6.

NEWLAND, D. H. **The Mining and Quarry Industry of New York State: Report of Operations and Production During 1914.** 88 pp. Index. *New York State Museum Bull. 178.* 1915.

Topographical survey and new street system of the Borough of the Bronx, [New York City], easterly of the Bronx River, [in 44 sheets]. 1:1,800. Topographical Bureau, Board of Public Improvements, New York, 1900.

North-Central States

—— **Chicago, Consular District of, Trade and Agriculture of the, Report for 1914 on the.** 39 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5504. London, 1915.

State of Illinois. 1:500,000. U. S. Geol. Surv., Washington, 1910.

Map of Iowa, issued by the Board of Railroad Commissioners. 1:506,880. Board of Railroad Commissioners, [Des Moines], 1915.

South-Central States

WEGEMANN, C. H. **A Reconnaissance in Palo Pinto County, Texas, With Special Reference to Oil and Gas.** (Contributions to Economic Geology, 1915, Part 2). Maps. *U. S. Geol. Surv. Bull. 621-E,* pp. 51-59.

WEGEMANN, C. H., AND R. W. HOWELL. **The Lawton Oil and Gas Field, Oklahoma.** (Contributions to Economic Geology, 1915, Part 2.) Maps, diagrs. *U. S. Geol. Surv. Bull. 621-G,* pp. 71-85.

Western States

HOUGH, WALTER. **The Hopi Indians.** 265 pp. Ill., index. The Torch Press, Cedar Rapids, Ia., 1915. $1. 8 x 6.

The environment, social life, food, toil, amusements, vital facts, religion, myths, tradition, and history of the Hopi are presented in such a manner that the professional student of peoples is quite as well repaid by reading Dr. Hough's book as is the layman. The chapter of short biographies greatly assists the reader in orienting himself. After reading that chapter one knows that the Hopi are simply every-day fragile vessels, in spite of the idealistic and artistic glaze with which Dr. Hough (like every other author who loves the people he describes) seems of necessity to adorn his wares.

The desert produced the Hopi. "Out of this environment the Hopi has shaped his religious beliefs, whose strenuous appeal is for food and life from the grasping destroyers of nature that whelm him. And in like manner he has drawn from this niggard stretch, his house, his pottery, baskets, clothing, and all the arts [which he possesses]." A water-hole, by misnomer called a "spring," and stunted maize enabled the Hopi to survive. And he has survived—healthful, temperate, lean, and enduring. A run of 130 miles within twenty-four hours is a Hopi accomplishment, though not the Hopi record. In culture also he has endured.

There were once four Spanish missions in Hopiland. About two hundred years ago the padres were pitched pitilessly to death over the precipitous sides of the mesas—and the Hopi are still pagans. On the tops of those high mesas the Hopi woman builds and owns her dwelling. There the man spins, dyes, and weaves. On the desert beneath them, near a tiny water-hole or periodic trickle of irrigating water, men, women, and children share the toil of gardens. With the exception that small flocks of sheep have taken the place of flocks of domestic turkeys, that there is a burro now and then, and that peaches, apricots, and a few other prized vegetal products have been added to the tiny garden, the Hopi still lives, thinks, and feels very much as did his ancestor in the same desert area before Columbus came to America. A. E. JENKS.

JAMES, G. W. **California, Romantic and Beautiful.** xxv and 433 pp. Maps, ills., index. The Page Co., Boston, 1914. $3.50. 7 x 10.

In the foreword the author refers to the genuine love which Californian writers have borne to the land of their songs. That the author is himself a good Californian no one will doubt: affection and enthusiasm speak from every page, and his peculiar naturalness and exuberance of style—at times almost naïve—are well calculated to imbue the reader with the California atmosphere and spirit. The book is well balanced, dwelling not only upon the wonders of the land and climate and upon the marvelous growth of its cities and industries, but upon the manifest inspiration which the exceptional geographic conditions have furnished to the intellectual and spiritual life of the people.

As in other books of his, so in this one, the author is likely to be suspected of carrying on a bit of surreptitious advertising. Thus in the chapter on the Yosemite Valley he commends the tourist to certain business establishments, while omitting mention of others of equal importance. A curious error puts at naught one of these "boosts." The one picture that accompanies the Yosemite chapter purports to represent Camp Curry, but instead of an attractive, pine-embowered tourist camp, one beholds a "raw" settlement in a sandy desert. F. E. Matthes.

James, G. W. **The Lake of the Sky: Lake Tahoe.** xiii and 395 pp. Maps, ills., index. The Author, Pasadena, Cal., 1915. $1.50. 5½ x 8½.

A very complete but somewhat overgrown popular "guide" to the Tahoe region, which should prove particularly useful to those who intend to make a long stay at the lake. For those who crave only a long-distance acquaintance it is almost too lengthy and too wordy.

The book's chief merit is that it brings together a variety of information which hitherto has been scattered, almost forgotten. Thus there are chapters on the discovery of Lake Tahoe by Fremont; on the vicissitudes of Fremont's abandoned howitzer; on the emigrant tragedy that gave Donner Lake its name; and on the Indian legends of the region. There is a brief explanation of the lake's geological history, consisting largely of quotations from Lindgren; a long chapter on glacial features taken from Le Conte, and another by that author on the more striking physical properties of the lake: its amazing clearness, its intense blue color, its reputed coldness, and the fact that it never freezes over—matters which are ever likely to be subjects of popular speculation and misconception.

The appendix contains quotations from Mark Twain, Starr King, Le Conte and John Vance Cheney F. E. Matthes.

Grant, U. S., and G. H. Cady. **Preliminary Report on the General and Economic Geology of the Baker District of Eastern Oregon.** Maps, ills. *Mineral Resources of Oregon,* Vol. 1, 1914, No. 6, pp. 129-161. Portland.

Pardee, J. T., and D. F. Hewett. **Geology and Mineral Resources of the Sumpter Quadrangle.** Ills. *Mineral Resources of Oregon,* Vol. 1, 1914, No. 6, pp. 7-128. [Reconnaissance report relating chiefly to the geologic bases of the economic development. The only detailed geologic report on this region, "The Gold Belt of the Blue Mountains of Oregon," by Waldemar Lindgren, 1901, is out of print.]

Point Conception, [Cal.], Sheet North I 10, North America, [International Map of the World]. 1:1,000,000. U. S. Geological Survey, Washington, 1915.

Mexico and Central America

Sapper, Karl. **Die Wirkung des Weltkriegs auf das Wirtschaftsleben Guatemalas.** *Weltwirtschaft,* Vol. 5, 1915, No. 7, pp. 135-136. Berlin.

Trelease, William. **The Agaveae of Guatemala.** Ills. *Trans. Acad. of Sci. of St. Louis,* Vol. 23, 1915, No. 3, pp. 129-152.

Wagner, M. L. **Die "Costa de Sotavento" in Mexiko.** Ills. *Deutsche Rundscau für Geogr.,* Vol. 37, 1914-15, No. 9, pp. 395-402; No. 10, pp. 452-460; No. 11, pp. 481-490.

West Indies

—— **Dominican Republic, Trade, Commerce, and Navigation of the, Report for 1914 on the.** 23 pp. Maps. *Diplomatic and Consular Repts.,* Ann. Series, No. 5477. London, 1915.

—— **Dominican Republic, The.** Ills. *Bull. Pan Amer. Union,* Vol. 40, 1915, No. 6, pp. 755-770.

—— **St. Thomas and St. Croix, Consular District of, Trade of the, Report for 1914 on the.** 13 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5485. London, 1915. [Recalls the former pre-eminence of St. Thomas as a distributing center for the

West Indies, Central and Caribbean South America, and contrasts with present conditions.]

WALLACE, T. R. **French West Indies: Martinique.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 28a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

St. Thomas og St. Jan, Dansk Vestindien. 1:70,000. Chart No. 265. Kgl. Sökort-Arkiv, Köbenhavn, 1914.

SOUTH AMERICA

GENERAL

KOEBEL, W. H. **The South Americans.** vii and 366 pp. Map, ills., index. Dodd, Mead & Co., New York, 1915. $3. 9 x 5½.

The author has written a number of books about South America. He has been there, it appears, a number of times and has gone about the continent a good deal. He has seen a good many things and writes matter that is very easy reading. He does not, however, see very far into things and does not succeed in characterizing the people of a continent.

The first third of his book contains many things that the reader will find of interest in connection with its title-subject. The greater part has been "filled in" with kindred matter about minerals, products, animals, plants, railroads, ports, and general locomotion. Essential pictures of the peoples are not found here. The illustrations are fine in choice and execution, and the index is good; but suppose the reader would like to learn something about the Italians and their wheat-raising colonies, which have shifted the economic emphasis of the country from grazing toward agriculture, he will find practically nothing. There is more insight in a chapter of De Amici's tiny "In America" than in this whole volume. Who rules these republics? Who votes? What part does the average man take in the government? What is the creole Peruvian, Argentine, or Chilean like? Koebel gives no answer to these questions. We cannot visualize his South Americans. He generalizes without enough study of the facts.

Here is a fair example. After mention of Rio, São Paulo, Bahia, and Pernambuco, he says: "From this it will be seen that Brazil is quite unusually well supplied with large towns" (p. 68). Quite the opposite is true. The figures Mr. Koebel gives show four towns of over 100,000 people each, in a total population of 17,000,000, or one large town to every 4,750,000. But the United States (and Canada, too) have one for every 2,000,000 people, Argentina one for every 2,667,000, the United Kingdom one for every 1,200,000. In all Europe only Russia, Rumania, and Austria-Hungary have fewer than Brazil. But there is some vagueness: possibly he means that an unusual percentage of the Brazilians live in large towns? Equally untrue, for on his own count 1,560,000 Brazilians live in the large cities out of a total population of 17,000,000; but the United States, in 1910, had 20,000,000 in the cities of over 100,000 in a total population of 92,000,000, or 21 per cent. to Brazil's 9 per cent. Apart from this failure to characterize the continent and the people, the book is a good one.

MARK JEFFERSON.

ECUADOR, PERU, BOLIVIA

GODING, F. W. **Ecuador.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 43a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [An unusually favorable year and excellent market conditions have increased the output and value of cacao, Ecuador's principal export. On the contrary, revolutions in Manabi and Esmeraldas have suppressed agriculture in these provinces and in particular the production of ivory nuts, an export valued at $2,118,030 in 1913 and $61,310 in 1914.]

—— **Iquitos, Trade of, Report for 1914 on the.** 17 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5501. London, 1915. [Iquitos is singularly dependent on the remote outside world. Its food-stuffs are imported from abroad; its business is financed from Europe. The former circumstance is responsible for an increased cultivation on the riparian properties and the latter somewhat modifies the disastrous effects of the present crisis, for, whereas smaller local concerns are permanently ruined, the larger foreign companies are only temporarily embarrassed.]

BRAZIL

HUTCHINSON, L. **Brazil: Rio Grande do Sul, Paraná, and Santa Catharina.** 10 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 40c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Rio Grande do Sul is increasing the home production of the two more considerable imports, wheat and wine. The former has increased from 15,000 tons in 1909 to 60,000 tons in 1913.]

Mappa economico do Brazil organisado por ordem do . . . Dr. Pedro de Toledo pelo Alvara José Rodrigues. 1:5,000,000. Accompanies Vol. I, "Relatorio apresantado ao Presidente da Republica dos Estados Unidos do Brazil," pelo Dr. Pedro de Toledo, Officinas da Directoria Geral de Estatistica, Rio de Janeiro, 1911.

Mattas e campos no Brasil, esboço organisado pelo Serviço Geologico e Mineralogico por . . . Dr. Pedro de Toledo. 1:5,000,000. Accompanies "Relatorio apresantado ao Presidente da Republica dos Estados Unidos do Brazil" pelo . . . Dr. Pedro de Toledo, Officinas da Directoria Geral de Estatistica, Rio de Janeiro, 1911.

PARAGUAY, URUGUAY, ARGENTINA, CHILE

HAMMERTON, J. A. **The Real Argentine: Notes and Impressions of a Year in the Argentine and Uruguay.** 453 pp. Ills. Dodd, Mead & Co., New York, 1915. $2.50. 8½ x 6.

''The Real Argentine'' is a misleading, or perhaps one had better say, a journalistic title. Out of eighteen chapters on the republic only two are devoted to the provinces as distinguished from the ''Port;'' but Buenos Aires, great as is the portion of the population it absorbs, is not the Argentine. The author himself recognizes this in his brief notes on the provincial towns, Córdoba and Rosario, of which his almost epigrammatic descriptions are quite admirable. Incidentally, however, the population of Rosario is over 200,000 and not ''about 150,000.'' Also the foundation of the Welsh colony of Chubut dates back fifty, not ''some twenty years ago.'' Even in non-statistical works approximate accuracy is desirable. The book is not agreeable reading. Medicine is seldom accepted with gratitude, and this book is avowedly designed as an antidote to the ''glorified advertising pamphlets'' that represent a considerable percentage of the current literature on Argentina. Traffic congestion, marble-veneer and stucco buildings, expensive living, indoor and outdoor amusements and amusement places, the weather, social life and hygiene, exaggerated patriotism and business methods, and, it must be admitted, the British colony also, share alike in condemnation. Partial excuse is found in the ''youthful spirit'' of the country. A study of the geographical factors that have created Buenos Aires would surely lead to more sympathetic treatment. One inevitably recalls Bryce's ''South America,'' a work that Mr. Hammerton, because of the disabilities attendant on the political and social status of the distinguished traveler, has not read save in fragmental translations that have appeared in South American papers. And he ingenuously quotes one or two of these re-translated into English!

—— **Chuquicamata, Procedimiento de explotación en.** (Traducido de *The Engineering and Mining Journal,* 25 de Abril de 1914, Vol. 97, Núm 17.) *Bol. de la Inspección de Geogr. y Minas,* Trim. 2, 1915, pp. 206-213. Santiago.

SILVA NARRO, DOMINGO. **El Mineral de Chuquicamata.** *Bol. de la Inspección de Geogr. y Minas,* Trim. 2, 1915, pp. 164-169. Santiago.

EUROPE

GENERAL

HERDMAN, T. **Some Geographical Factors in the Great War.** 71 pp. Maps. A. Brown & Sons, Ltd. London, 1915. 9d. 5 x 7½.

The author is lecturer in geography in the Municipal Training College at Hull, England, and has, therefore, a special interest in the geographical aspects of the world-war. In the space of a few pages he discusses very briefly some of the more obvious physical, economic, and racial aspects of the great contest. Recognizing that the surface features of Europe must exert a controlling influence on the movements of armies, he devotes a chapter to discussing the natural gateways between the hostile countries. Unfortunately, the description of a variety of land-forms in purely empirical terms leaves the reader with a confused and hazy mental picture of the surface features, which will not greatly aid his understanding of the plans of campaign now being unfolded from month to month. A paragraph of simple explanatory description, reinforced by one or two diagrams or good maps, would quadruple the value of this chapter. The maps which do accompany the text are poorly drawn and are of but moderate usefulness. Of real value are the historical references to repeated army movements along the same routes in past wars. Half a dozen pages are given to ocean routes and ''sea gates,'' as affecting naval operations. The final chapter on "The Problems of Nationality," shows the difficulties which at the close of the war must confront those who would remake the map of Europe by drawing just and natural boundaries in accordance with the distribution of nationalities. D. W. JOHNSON.

HENKEL, L. **Die politische Karte von Europa in ihrer geschichtlichen Entwicklung.** *Geogr. Anzeiger,* Vol. 16, 1915, No. 10, pp. 289-293. Gotha.

TE LINTUM, C. **De oorlog en de aardrijkskundige studiën.** *Vragen van den Dag,* Vol. 30, 1915, No. 9, pp. 706-718. Amsterdam.

Orographical sketch map of Europe, to illustrate the paper by Vaughan Cornish, D. Sc. 1:15,000,000. *Geogr. Journ.,* May, 1915.

War Map of Europe. 1:4,800,000. W. & A. K. Johnston, Ltd., Edinburgh, [1914].

Conflitto europeo: Carta dell' Europa centrale. 1:3,700,000. A. Vallardi, Milano. 1915.

La conflagrazione europea (carta dell' Europa centrale). 1:5,000,000. A. Vallardi, Milano, 1915.

BRITISH ISLES

WIEDENFELD, KURT. **Liverpool im Welthandel.** *Geogr. Zeitschr.,* Vol. 21, 1915, No. 8, pp. 453-459.

The Hebrides: Sheet North O 29, International Map of Europe. 1:1,000,000. Ordnance Survey, Southampton, 1912.

Scotland—The Highlands: Sheet North O 30, International Map of Europe. 1:1,000,000. Ordnance Survey, Southampton, 1912. [These two sheets are the final editions of the unrevised proofs listed under "Scotland" in the *Bull. Amer. Geogr. Soc.,* Vol. 44, 1912, p. 400. The 100-meter contour has been added.]

Map showing the fishing grounds frequented by British trawlers, to illustrate the paper by Prof. J. Stanley Gardiner, F. R. S. 1:25,000,000. *Geogr. Journ.,* June, 1915.

Sketch maps of the Macclesfield district, to illustrate the paper by B. W. Baker. (a) Geology and physiography; (b) Physical. 1:1,000,000. *Geogr. Journ.,* August, 1915.

THE LOW COUNTRIES, LUXEMBURG

—— **Amsterdam, The Port of: A Short Account of the Docks, Harbour Works, and Trading Establishments of the City of Amsterdam.** 80 pp. Maps, ills. Published by the Municipality of Amsterdam, 1914. 6½ x 9½.

The merchants of the Netherlands are very active and progressive and have the support of a sympathetic and efficient government. The proof of this is found in the successful way in which natural obstacles have been overcome and important seaports made and kept, in answer to the demands of modern traffic. Rotterdam has made herself one of the world's great ports, and Amsterdam, though left somewhat on one side of the great world-highway, still holds a proud place as a warehousing port, with claims of first rank in some commodities still, such as cinchona bark and tobacco.

A brief and well-written account of the port and its advantages is here given. The maps give a very good idea of the dock facilities, of the proposed extension of the docks to the west, and of the North Sea Canal. This canal already has been deepened to give passage to boats of 31-foot draft, and the lock has provision for 46 feet ultimately. J. PAUL GOODE.

ZEEMAN, K. **Moderne geographie van Nederland.** 2nd edit. xii and 331 pp. Maps, ills., index. W. Versluys, Amsterdam, 1914. 9 x 6.

In less than two years it has become necessary to put this work to press a second time, for it immediately found its place as among the standard works on the geography of the Netherlands. The method of the author is commendable in any text of geography; it is indispensable in such a land as the Low Countries where the new links with the ancient diluvium, the artificial with the natural. Zeeman works directly from the physiography of his land to the economic or industrial geography, always a valuable method and here essential. The work is expressly prepared for schools of the *gymnasium* type *(Rijksdagnormaalschool),* and is immeasurably superior to the course in geography and industry offered at some of our older universities.

SCANDINAVIA, INCLUDING FINLAND

LEACH, H. G. **Scandinavia of the Scandinavians.** x and 332 pp. Ills., index. Charles Scribner's Sons, New York. 1915. 7½ x 5½.

A terse, yet clear compilation of the salient facts about the history, constitution, military and naval efficiency, social work, and literature of Denmark, Norway, and Sweden. Within about one hundred pages for each country, the average reader will find all the general information necessary. After a brief chapter on the Scandinavians in general, Denmark, Norway, and Sweden are described in the order named. Norway was the first nation to adopt equal suffrage. The national political issue is the language question. The language of the cultivated, a Norwegian Danish, is at grips with the dialect of ninety-five per cent. of the people. The work of the Polar explorers Amundsen, Nansen, Sverdrup, and Stefansson is well described, especially the Norwegian geographical work in Greenland. The work of Sven Hedin, the explorer of Tibet, in arousing his nation to military preparedness receives prominence. A brief chapter is given to Lapland; and the work closes with a description of the mid-summer eve festival at Dalecarlia. The illustrations of Norse scenes and Norse persons of prominence are excellent. DAVID H. BUEL.

GANDOLFI-HORNYOLD, A. **La Norvège et ses pêches maritimes.** *Le Globe,* Vol. 54, 1914-15, Nov.-April, pp. 20-23. Geneva. [Abstract of a lecture.]

Karta över södra Sveriges landformer av Sten de Geer. 1:500,000. Sveriges Geologiska Undersökning, Stockholm, [1913]. [Accompanied by booklet.]

Det Danske Hedeselskab Plantager, Vandings- og Afvandingsanlaeg i Jylland, 1913. 1:333,000. Danske Hedeselskab, Viborg, 1915.

AUSTRIA-HUNGARY

BLINK, H. **De havens van Aquileja, Venetie en Triest naar hun opkomst en historische beteekenis.** Maps. *Tijdschr. voor Econ. Geogr.,* Vol. 6, 1915, No. 10, pp. 369-380. Amsterdam.

HALSTEAD, A. **Austria-Hungary.** 22 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 1b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Supplements the usual analysis of import and export trade with a discussion of the activities and influence of the official chambers of commerce.]

Carta base pel raggruppamento delle nazionalità nell' I. R. Monarchia e stati limitrofi, by Adriano Colocci. 1:4,000,000. Istituto Geogr. De Agostini, Novara, [1914?].

Panorama delle nostre terre irredente. [2 sheets]: 1, Venezia Tridentina; 2, Venezia Giulia. 1:250,000. A. Vallardi, Milan, [1915].

La frontiera italo-austriaco e territori della 'piu grande Italia.' 1:1,200,000. A. Vallardi, Milan, 1915.

BALKAN STATES, INCLUDING RUMANIA

BALDACCI, A. **Itinerari albanesi del 1896.** Ills. *Boll. Reale Soc. Geogr.,* Vol. 4, 1915, No. 10, pp. 1020-1044. Rome.

BRIQUET, WILLIAM. **Mœurs et coutumes des tribus albanaises.** *Le Globe,* Vol. 54, 1914-15, Nov.-April, pp. 36-47. Geneva. [Abstract of a lecture.]

BRIQUET, WILLIAM. **De la frontière serbe à l'Adriatique: Voyage en Albanie.** *Le Globe,* Vol. 54, 1914-15, Nov.-April, pp. 28-36. Geneva. [Abstract of a lecture.]

—— **Corfu, Trade and Commerce of, Report for 1914 on the.** 24 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5495. London, 1915.

ISCHIRKOFF, ANASTAS. **Ethnographische Karte des Bulgarentums auf der Balkanhalbinsel im Jahre 1912.** Map. *Petermanns Mitt.,* Vol. 61, 1915, Sept., pp. 339-343.

—— **Piræus, the, and District, Trade of, Report for 1914 on the.** 27 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5483. London, 1915.

Historical map of Bulgaria from the beginnings of the Bulgarian Czardom to the present time, 679-1915. [In Bulgarian.] 3 maps: 1, Bulgarian Czardom before the 9th century; 2, Bulgarian Czardom from the 3rd to 13th century; 3 Bulgarian Czardom at the beginning of the 20th century. By K. Antonok. [Approximately 1:7,500,000.] Government Printing Office, Sofia, 1915.

ITALY

BRUNO, ALESSANDRO. **Il transito attraverso i porti italiani del commercio estero con l'Africa.** *L'Africa Ital.,* Vol. 34, 1915, No. 8, pp. 206-216. Naples.

Guarini, E. **Espansione economica italiana verso l'America latina.** *L'Esploraz. Commerc.*, Vol. 30, 1915, No. 6, pp. 237-242.

—— **Italy, Foreign Trade of, Report for 1914 on the.** 26 pp. *Diplomatic and Consular Repts.* Ann. Series, No. 5491. London, 1915.

La Venezia, le Alpi Carniche e Giulie, by Pio Galli. 1:600,000. A. Vallardi, Milan. [1915].

Spain, Portugal

—— **Azores, the, Trade and Commerce of, Report for 1914 on the.** 13 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5492. London, 1915.

Gracey, W. T. **Seville, Valencia.** 22 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 15c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Contains a note on the commercial consequence to Valencia of the isolation typical of the Iberian Peninsula.]

Muñoz Gil, P. **Memoria anual del Cónsul de Chile en Logroño, correspondiente al año 1914.** *Bol. de Relaciones Exteriores*, No. 56, 1915, pp. 11-29. Santiago, Chile. [The international rice congress held in the current year in the city of Valencia calls attention to the importance of the production of this cereal in Spain. The intensive cultivation produces a yield per hectare of 8,000 to 10,000 kilograms—a figure which no other rice-producing country can approximate.]

Guipúzcoa, [Province of]. 1:200,000. Alberto Martin, Barcelona, [1915].

Lugo, [Province] of. 1:400,000. Alberto Martin, Barcelona, [1915].

AFRICA

General

Herbertson, A. J., and J. R. Howarth, edits. **The Oxford Survey of the British Empire: Africa.** xvi and 547 pp. Maps, ills., index. Oxford University Press (Amer. Branch), New York, 1914. 9 x 6.

The only unity attainable in grouping all British Africa in one volume is political rather than geographical, and even the political aspects of African territories cannot be adequately represented without some reference to *other* Africa. Most of the volumes of this series must labor under this defect. The book affords a source of information about British Africa of the most modern sort by competent hands, has a good index, and much statistical matter. To a geographer the most satisfying chapters are those that treat of the larger African areas, large enough to constitute something like geographical units. Such are Capt. Lyons' "Sudan and Egypt," Sir Harry Johnston's "East Africa and Uganda" and the numerous papers on South Africa by various authors.

Capt. Lyons has used his intimate knowledge of the Nile countries to good advantage. The account of the regimen of the floods is illuminating. In referring to the fertile silt of the river he implies that the waters impounded behind the dam at Assuan lack it, without, I think, definite statement. He gives the density of population in the Delta as 640 to the square mile; of the province Menuf'ieh at the apex of the Delta at 1,600. This is a purely agricultural, country population, though the homes are fearfully huddled to spare the tillable ground. Probably only Japan and China can show such figures. The immediate Nile valley, too, is most densely settled, while the uninhabited deserts hem it in closely on either hand. In spite of Egypt's material progress, most of the people can neither read nor write.

In South Africa the race question acquires prominence from the presence of many whites of many occupations. There they spell their native with a capital N. He outnumbers the whites five to one but does not supply labor enough to develop the country. Yet his presence deters the whites from manual labor. In most of British Africa the whites are simply rulers and rule admirably. Difficulties arise when white men are more numerous, of more social classes, and live somewhat intermingled with the blacks. The Dutch and English have different views on the native problem. In the old Boer states the black man can neither own land nor acquire the franchise. Possibly, a franchise may be given him that will assure him a limited representation.

Mark Jefferson.

Cufino, L. **Lo sviluppo commerciale dell' Africa tropicale in rapporto ai mezzi di trasporto e di communicazione.** *L'Africa Ital.*, Vol. 34, 1915, No. 9, pp. 225-239. Naples.

ATLAS REGION

—— **Morocco, Trade of, Report for 1913 on the.** 70 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5467. London, 1915.

SAHARA, INCLUDING EGYPT

Atlas of Egypt [in Egyptian]. 11 pls. Survey Dept., Cairo, [1913?]. 11 x 10.

SUDAN AND UPPER GUINEA

KOCH, C. W. H. **Die Stämme des Bezirks Molundu in sprachlicher, geschichtlicher und völkerkundlicher Beziehung.** Ills., index. *Baessler-Archiv*, Vol. 3, No. 6, pp. 257-312. B. G. Teubner, Leipzig, 1913. Mk. 5. 13½ x 10.

This monograph completes the third volume of the excellent *Baessler-Archiv*, a series of works of very high character. The very valuable paper deals with the peoples of the forested region in what was the southeastern corner of Kamerun before the enlargement of 1911. After eliminating the recent mixture of population in the region, Koch delimits very successfully the earlier peoples of Sudan and Bantu stock. These outposts of Sudan culture will be found of peculiar interest. Within the Molundu district there are groups somewhat widely parted. One, at the boundary of the forest and grass land in the interior, comprises three tribes known as Kaka, Yangere, and Bokari; the other consists of the Bangandu settlements along the lower reaches of the Bumba River. In all these peoples, so far as examination has been directed upon them, there appears Bantu admixture, both social and somatic; but, on the other hand, the Bantu, even at some distance from these Sudanese centers, show the results of admixture. An abundance of statistical detail is provided for the support of the author's conclusions, and in the linguistic section nineteen numerals and a dozen common words in twenty-six languages afford the means for initial comparison with such well-established standards of African speech as Hausa on one side and Kisuaheli on the other.

WILLIAM CHURCHILL.

MARTY, PAUL. **Les tribus de la Haute Mauritanie.** Ills. *Reseign. Colon.*, Vol. 25, 1915, No. 5, pp. 73-82; No. 6-7, pp. 118-126; No. 8, pp. 136-145.

YERBY, W. J. **British West Africa: Gambia, Gold Coast Colony, Nigeria.** 16 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 67a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Owing to the former extent of German and Austrian commercial interests, the trade of Nigeria for the past year has probably suffered more than that of any other West African colony. Gambia, with a prosperity based almost entirely upon peanut cultivation, is in so prosperous a condition that it has easily withstood the present disruption of trade.]

Afrique occidentale française: carte administrative, télégraphique, postale et des chemins de fer. 1:6,000,000. Accompanies "Annuaire du Gouvernement Général de l'Afrique Occidentale Française, 1913-1914," Paris, 1914.

Sénégal. 1:2,000,000. Accompanies "Annuaire du Gouvernement Général de l'Afrique Occidentale Française, 1913-1914," Paris, 1914.

Guinée. 1:2,000,000. Accompanies "Annuaire du Gouvernement Général de l'Afrique Occidentale Française, 1913-1914," Paris, 1914.

CONGO BASIN AND LOWER GUINEA

—— **Congo, the, Trade of, Report for 1913 on the.** 11 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5493. London, 1915. [The commercial situation of 1913 was dominated by the rubber crisis.]

EAST AFRICA

HAYS, P. C. **British East Africa and Uganda.** 11 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 65a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [The war has cut off the considerable transit trade from German East Africa that usually travels via Lake Victoria and the Uganda railway to Mombasa.]

SOUTH AFRICA

THIELE, E. O. **Further Notes on the Physiography of Portuguese East Africa, between the Zambesi River and the Sabi River.** Map, ills. *Geogr. Journ.*, Vol. 46, 1915, No. 4, pp. 276-286.

ASIA

General

Bernier, François. **Travels in the Mogul Empire, A. D. 1656-1668.** Translated on the basis of Irving Brock's version and annotated by Archibald Constable (1891). Second edition, revised by Vincent A. Smith. li and 497 pp. Map, index. Oxford Univ. Press (Amer. Branch), New York, 1914. $1.75. 7½ x 5½.

A second edition of the translation of the well-known French physician, François Bernier, who was the pupil of Gassendi and lived through the greater part of the seventeenth century. The work consists of a ''History of the States of the Great Mogol, during the Great Rebellion, and for five years afterwards;'' letters to M. Colbert on the condition of Hindustan; to M. de la Mothe le Vayer, concerning Delhi and Agra; to M. Chapelain, on the Gentiles (Hindus) of Hindustan; and to M. de Merveilles, descriptive of a journey to Cashmere, the ''Paradise of the Indies;'' and concludes with answers to inquiries about the periodic rains of India, the currents of the sea, the winds in the Indies, and the fertility, beauty, and wealth of the Kingdom of Bengal. The work is remarkable for clearness of style and accuracy of observation. Bernier's maps of the countries through which he traveled show an unusually accurate geographical knowledge for the seventeenth century. David H. Buel.

Huntington, Ellsworth. **Asia: A Geography Reader.** xii and 344 pp. Maps, ills., index. Rand McNally & Co., Chicago, 1912.

This little book appears to the reviewer more important than any geographic work he has read for years. Its importance lies in the fact that there is an immense need of books designed for our schools that make constant use of sound, modern, geographic principles. None of the textbooks published in America do it more than in occasional spots.

Dr. Huntington has two rare qualifications for his task. In the first place, he knows his Asia. He has lived among Asiatics, often alone, and for years. He has acquired real sympathy with them in spite of the divergence of their habits from his, exactly as Stefansson has come to sympathize with the Eskimos. As the second qualification Dr. Huntington has a distinct literary gift. He can tell his story. Among scientific men this appears to be looked on with suspicion, partly because it is rare, and partly because it is no proof of scientific knowledge. But neither is it disproof. This work is ''popular'' and ''educational,'' yet what book on Asia reveals as this does the interaction of land and people? I am sure there is none.

Doubtless a critical eye can find errors. One might get the idea from the book, for instance, that the people of India live on bananas that grow for them while they sit in the sun. But such imperfections are bound to occur in all books. They do not characterize Dr. Huntington's book. Geographical science is already in possession of a goodly body of sound scientific principles of which even the educated public has little conception. We need not one but many Huntingtons to make geography known to the reading public, just as astronomy has needed its Flammarions and its Lockyers.

Mark Jefferson.

Vosberg-Rekow, —. **Asiatisches Jahrbuch.** Herausgegeben im Auftrage der Deutsch-Asiatischen Gesellschaft von ——. 1914. 369 pp. J. Guttentag, Berlin, 1914. Mk. 7.50. 9½ x 7.

A valuable annual dealing with each political division of Asia, including the Philippines, in relation to its geography, the leading facts of its history, population, government, military systems, money, weights and measures, production, trade, and means of communication. The latest and most reliable statistics available are used.

Asia commerciale e politica. 1:8,000,000. Insets on the scale of 1:30,000,000: Asia politica; agricoltura, pescherie; piante coloniali; industria e commercio. By Guido Cora. 1:8,000,000. Paravia & Co., Turin, [1914]. [Wall map.]

Turkey in Asia, Arabia, Caucasia, Iran

Macalister, R. A. S. **The Philistines: Their History and Civilization.** British Academy, London (The Schweich Lectures, 1911). 136 pp. Index. Oxford Univ. Press (Amer. Branch), New York, 1913. $1.20. 9 x 6.

This tract has a double value. To the scanty and vague text of the sacred canon, Professor Macalister has added the records of Egypt and of the Euphrates valley, which more than double our knowledge of the stout race with whom Israel was in constant and not always successful conflict until the time of David. He gives a translation of the Golénischeff papyrus detailing the adventures of Wen-Amon to the land of the Philistines; this interesting voyage in the Levant, about 1110 B. C., deserves a place among the works of the fathers of geography. The greater value of the work lies in the establishment of the Philistines among the great peoples of early civilization. The author establishes their origin in the Cretan culture which is now coming into our knowledge. He traces them to their position on the eastern littoral of the Mediterranean and to their command of that sea. He points out their kinship with the race of the Troad, against whom the Greeks fought in the Trojan war. Less satisfactorily, yet quite attractively, he suggests their association with the Etruscans, or at least with certain of the predecessors of Aryan folk on the Italian peninsula. There are debatable points in his conclusions; yet, disregarding these matters of ethnology, every geographer should familiarize himself with the voyage of Wen-Amon in this pleasant setting.

TCHOBANIAN, ARCHAG. **The People of Armenia, Their Past, Their Culture, Their Future.** Translated by G. Marcar Gregory. 68 pp. J. M. Dent & Sons, Ltd., London, 1914. 4 x 6. 1s. 6d.

Originally a lecture, this brief record of the achievement of Armenians in world history has the advantage of being presented by a native of the country. In spite of its sketchy character the account points to the strong influence of a mountain home in the growth of a people. In the country's art as in its history, this influence of the land is ever present. Fragments of folk-songs in the text prove this no less than the survival of the race in the midst of recurrent alien invasions. The text is thoroughly instructive. Its brevity is to be deplored.

—— **Kerman, Consular District of, Trade of the, Report for 1913-14 on the.** 22 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5482. London, 1915. [Commerce is apt to suffer somewhat from raids by the Baluchis, who are always ready to take advantage of the administrative weakness of this frontier province.]

—— **Khorasan, Trade of, Report for the Year ending March 20, 1914, on the.** 20 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5481. London, 1915. [Transportation difficulties are shown in a table summarizing the distance, time, freight charges, and modes of conveyance along the various trade routes.]

—— **Muscat, Trade of, Report for 1913-14 on the.** 31 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5473. London, 1915.

Map to illustrate a seventh Journey [in Persia] by Lt. Col. P. M. Sykes, C. M. G., C. I. E. 1:1,000,000. With enlargement of eastern section of main map: Darragaz and the sources of the Atrek. 1:250,000. *Geogr. Journ.*, May, 1915.

MANCHURIA, KOREA, JAPAN

—— **Formosa, Island of, Report for 1914 on the Trade of the.** 26 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5487. London, 1915.

—— **Japan, Trade of, Report for 1914 on the.** 98 pp. *Diplomatic and Consular Repts.*, Ann Series, No. 5503. London, 1915. [The war has produced most serious effects in the rice and silk markets. To retrieve the former, government purchases have been authorized. A similar attempt to force up the price of silk will be more severely criticized, for the silk market is abroad and is of an importance evident from the fact that it normally accounts for 90 per cent. of the total exports.]

KOCH, D. P. **Japans Industrie und der Weltmarkt.** *Weltwirtschaft*, Vol. 5, 1915, No. 7, pp. 129-133. Berlin.

The northern Japanese Alps to illustrate a paper by Rev. Walter Weston. 1:600,000. *Geogr. Journ.*, Sept., 1915.

CHINA

HOSIE, ALEXANDER. **On the Trail of the Opium Poppy: A Narrative of Travel in the Chief Opium-Producing Provinces of China.** Vol. 1: viii and 300 pp. Vol. 2: 308 pp. Map, ills., index. G. Philip & Son, London, 1914. 25s. 9 x 6.

The purpose of this trip was to check up the honesty of the execution of the laws of China suppressing the opium trade. With the import from India wholly subject to British regulation the local production was the only point which called for examination. Prepared opium may be concealed without difficulty; its use is not always easy to detect, the more particularly when it is eaten instead of smoked; but the cultivation of the poppy is a most trustworthy index of the opium traffic, since the plant is forbidden by the repressive law and its presence in the fields shows laxity or corruption of administration on the part of local officials. Hosie in the season of cultivation traversed the six provinces capable of raising the poppy, Shansi, Shensi, Kansu, Szechuan, Yünnan, and Kueichou. He found that in some places the growth of the poppy had been given up, in others greatly reduced; all this is a part of the greater campaign against opium and will fluctuate with the extirpation of the addiction to that drug.

The author has made several valuable contributions to the knowledge of little-known areas. The six provinces are well known in general, but he left the familiar highways through choice, avoided the railroads and the rivers and picked an uncomfortable way through lanes which might bring under his examination the utmost expanse of rural district. It was uncomfortable journeying, at times it was not without risk, but it has furnished a considerable supply of information upon hamlets and paths which have not before been visited by so competent an observer. This particularly applies to the lateral roads of these provinces. The work will rank as the first record of many lines of communication, with an evaluation of their practicability, and to that extent is a contribution to the itinerary of central China. William Churchill.

Maybon, Albert. **La République Chinoise.** xix and 268 pp. A Colin, Paris, 1914. Fr. 3.50. 7½ x 5.

The author is instinct with a lively sympathy for that feature of Chinese life and thought which we may designate its orientalism, that motive power which in any set of circumstances directs the Asiatic mind to a solution which to us is scarcely comprehensible. It is this quality which imparts such lively interest to the narrative and furnishes the requisite skill in the interpretation of men as controlling the events which would control Europeans in far other fashion, and which makes for the great value of this philosophical story of the overthrow of the empire of the Manchus and the establishment of the new republic of China. The key of the situation lies in the measure of two men, Yuan Shih-k'ai and Sun Yat-sen, and each of these is to be regarded only as the representative of the millennial ethics of the Chinese race. It is impossible for any government to exist in China which does not live in full conformity with the ancient system of morals which has been the salvation and at once the torpidity of the Chinese. Dr. Sun failed to meet the moral requirements and was allowed to pass into scheming exile. Yuan is still in the balance; it is impossible as yet to discover if he is to be the leader of his people, but in this volume we have a very careful estimate of his character. William Churchill.

Salzmann, Erich von. **Das revolutionäre China.** 171 pp. Maps, ills. D. Reimer (E. Vohsen), Berlin, 1913. Mk. 5. 9½ x 7.

Though superficial, these studies of China in its revolution and counter-revolution are interesting. Captain von Salzmann premises his reports by the assurance that he has been careful to avoid the opinions of the older settled Europeans of the treaty ports. It is something to have divested himself of the flying gossip of the China coast, yet at the same time he has neglected the mature judgment of those men who have devoted long years to the better comprehension of China and who have learned better to evaluate the great Chinese leaders than could be within the power of a casual traveler. Furthermore the author seems to have come but little into contact with the greater figures of the revolution or with the great Chinese administrators who are essaying to apply to the needs of the new situation the education which they have acquired in the Occident. The chief sources of his information seem to have been a handful of German railway engineers and the less important Chinese functionaries with whom they were engaged. This may serve to account for his consistent attitude of somewhat sneering criticism addressed to the American interest in China, almost wholly educational and religious. We regard the volume as a reflection of the official ideas prevalent in Kiauchau, Germany's footprint on Chinese soil. William Churchill.

—— **Amoy, Trade of, Report for 1914 on the.** 8 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5490. London, 1915.

—— **Canton, Trade of, Report for 1914 on the.** 14 pp. *Diplomatic and Consular Repts,* Ann. Series, No. 5507. London, 1915. [Floods—the worst on record for 80 years—that occurred in June caused considerable loss of crops and damage to mulberry trees and are said to have left over 1,000,000 people homeless.]

—— **Changsha, Trade of, Report for 1914 on the.** 16 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5489. London, 1915. [Contains a note on the production of antimony. Supplies from northeastern France and from Austria-Hungary are cut off by the war and Mexican and Bolivian mines are shut down, leaving Hunan the only important source of supply. Productivity of the mines and cheapness of labor have always made the export profitable, and now with antimony regulus risen from £25 to £100 per ton the native mine owners have realized enormous profits.]

—— **Kiungchow, Trade of, Report for 1914 on the.** 12 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5509, London, 1915.

—— **Wuhu, Trade of, Report for 1914 on the.** 12 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5498. London, 1915.

Carte de la Chine Orientale par le Commandant Friguegnon de l'Infanterie Coloniale [in 9 sheets.] 1:2,000,000. Service Géogr. de l'Indo-Chine, [Hanoi], 1908.

Région de Lao Kay à Yun Nan Fou. 1:500,000. Service Géogr. de l'Indo-Chine, [Hanoi], 1903.

Carte du territoire de Quang-Tcheou [in 12 sheets]. 1:25,000. Service Géogr. de l'Indo-Chine, [Hanoi], 1901.

INDIA

DEWAR, D. **Birds of the Indian Hills.** 364 pp. Index. John Lane Co., New York, 1915. 8 x 5. [A companion volume to "The Fauna of British India," in which are discussed the birds of the Himalayas, and the common birds of the Nilgiris and of the Palni Hills. The treatment is by climatic and migration groups.]

FARTHER INDIA, INCLUDING BURMA

Carte de l'Indo-Chine [in 9 sheets]. 1:1,000,000. Service Géogr. de l'Indo-Chine, [Hanoi], 1903.

Carte schématique des communications du Tonkin. 1:500,000. Service Géogr. de l'Indo-Chine, [Hanoi], 1911.

Carte des voies navigables du Tonkin. 1:500,000. [Service Géogr. de l'Indo-Chine, Hanoi], [1915?].

Cartes des communications du Laos [in 5 sheets]. 1:750,000. Service Géogr. de l'Indo Chine, [Hanoi], 1908.

Carte du groupe d'Angkor. 1:25,000. Service Géogr. de l'Indo-Chine, [Hanoi], 1910.

Carte de l'Ile Ke-Bao, levée et dessinée par M. le Lieutenant de Bosredon du Bureau Topographique de l'État-Major des Troupes de l'Indo-Chine. 1:20,000. Bureau Topographique des Troupes de l'Indo-Chine, [Hanoi], 1898.

Carte servant a suivre la marche des typhons ou dépressions signalées par l'Observatoire de Phu-Lien. [1:4,000,000.] Service Géogr. de l'Indo-Chine, [Hanoi], [1910?].

Ile de Poulo Condore. 1:25,000. Service Géogr. de l'Armée, [Paris], 1900.

MALAY ARCHIPELAGO, INCLUDING THE PHILIPPINES

BERNARD, C. **Verslag van eene reis naar Sumatra's O[ost]-K[ust] en de Padangsche bovenlanden ter bestudeering van de theecultuur.** 95 pp. Map, ills. Dept. van Landbouw, Nijverheid en Handel, Batavia, 1913. Fl. 1.50. 11 x 7½.

With an agreeable narrative style Dr. Bernard has supplied all the more important facts relative to the somewhat recently systematized culture of tea in the eastern and Padang divisions of Sumatra. That the industry has come under intelligent treatment is largely due to the soil investigations conducted by the author at the great experimental gardens in Buitenzorg. He is associated with the colonial department of agriculture as official adviser on tea culture and is therefore in a position to write with commanding authority. Particular interest attaches to this report, because it shows how the soil capable of producing teas of light flavor, as compared with the heavier teas of Ceylon and Assam, is being brought into activity. Tea of a light but delicate flavor which will stand up under transport is always sure of market; accordingly these new orchards may be expected to contribute largly to the assets of Sumatra.

WILLIAM CHURCHILL.

Topographische kaart der afdeelingen Tegal, Brebes en Pemalang van de residentie Pekalongen [Java] in 2 bladen. 1:100,000. Topogr. Inrichting, The Hague, 1913.

Topographische kaart der afdeelingen Pekalongan en Batang van de residentie Pekalongen [Java] in 1 blad. 1:100,000. Topogr. Inrichting, The Hague, 1913.

Zuidkust Borneo: Barito-rivier van den mond tot Soengai Kween. Met plan van Martapoera-rivier nabij Bandjermasin. 1:50,000. Chart No. 67, Ministerie van Marine, The Hague, 1915.

Noordkust Java: Oostervaarwater er van Soerabaja. 1:75,000. Chart No. 98. Ministerie van Marine, The Hague, 1915.

Vaarwaters en ankerplaatsen op de westkust van Nieuw-Guinea. Blad III, Noord- en Noordoostgedeelte der Golf van Bintoeni. 1:75,000. Chart No. 354. Ministerie van Marine, The Hague, 1915.

Oostkust Halmahera: Weda-baai. 1:150,000. Met plans van de reedes Messa, Patani, Foja en Weda en van Baai Kokka. 1:150,000. Chart No. 390. Ministerie van Marine, The Hague, 1915.

AUSTRALASIA AND OCEANIA

General

Taylor, Griffith. **A Geography of Australasia.** (The Oxford Geographies, edited by A. J. Herbertson). 176 pp. Maps, index. Oxford Univ. Press (Amer. Branch), New York, 1914. 40 cents. 8 x 5.

The geology, physiography, and geography of the various regions of Australasia are considered. The control of the inorganic over the organic is described. A history of exploration, industrial development, etc., is also given.

In writing of the gold discoveries, the author points out that "Two isolated goldfields in the South Australian desert (Tarcoola, discovered in 1893, and Arltunga, in 1902) show that there is no reason to despair of the discoveries of further 'Kalgoorlies.'" Mr. Taylor also brings out other future possibilities of Australasia, and the climates and products of its various regions in relation to the corresponding regions of other continents.

There are many maps and other illustrations in black and white. The subjects are treated briefly, concisely, and in a competent and interesting manner.

Wilbur Greeley Burroughs.

Andrews, E. C. **The Canbelego, Budgery, and Budgerygar Mines.** Part II of the Cobar Copper and Gold-Field. 121 pp. Maps, ills. *New South Wales Geol. Surv. Mineral Resources No. 18.* Sydney, 1915. [Contains a description, including a historical note of the Mount Bobby mine, for some years the most productive gold mine in New South Wales.]

Dannevig, H. C. **Biological Results of the Fishing Experiments Carried on by the F. I. S. "Endeavour," 1909-14.** Vol. 3, Part 7: **The Continental Shelf of the East Coast of Australia,** pp. 339-344. Part 8: **Bass Strait,** pp. 347-353. Dept. of Trade and Customs, Sydney, 1915. [Physiographic discussions based on the hydrographic work of the F. I. S. *Endeavour,* 1909-14.]

—— **Weather Report and Meteorological Abstract, Monthly, Australian.** Maps. Vol. 3, 1912, No. 3, March, pp. 107-154; No. 4, April, pp. 159-204; No. 5, May, pp. 209-254. Commonwealth Bur. of Meteorol., Melbourne, 1914.

Melanesia, Micronesia, Polynesia

Carne, J. E. **Notes on the Occurrence of Coal, Petroleum, and Copper in Papua.** 116 pp. Map, ills. *Bull. of the Territory of Papua No. 1.* Melbourne, 1913. 10 x 8.

The material contained in this bulletin is a sketch report of the most cursory sort upon three possible mineral resources of Papua, this being the official designation of that southeastern portion of New Guinea which is held as a possession by the Commonwealth of Australia. Prospectors have reported finds of coal, petroleum, and copper, and before the lands could properly be denounced under mineral claims it was necessary for the Australian government to undertake a reconnaissance of the region. In this report it is made clear that surface indications of the three mineral products have been found, but geological examination has failed to establish the possibility of working the discoveries to commercial profit. Carne is inclined to regard the presence of petroliferous earth as a promise that further exploration may disclose commercial deposits and thus link Papua with the oil fields of the Malay Archipelago.

Colwell, James, edit. **A Century in the Pacific.** Introduction by W. H. Fitchett. One volume—five parts: scientific, sociological, historical, missionary, general. 781 pp. Index. C. H. Kelly, London, 1914. 21s. 9½ x 6½.

Because this work is of the encyclopedic type it is of uneven excellence. The editor assembles within the compass of a single volume no less than twenty-six essays by twenty-five authorities upon special themes. The result is that the objective varies ith each essay and there is quite as much variety in treatment and style. It is nevitable that a large part of the work should be assigned to missionaries, for, at the ringes of civilization, it is only the resident missionary who has the interest in the ife of the savage to direct his observation and the skill with the pen which may stablish the record. The Protestant mission in the Pacific is accordingly exalted, and, n case of conflict, the Wesleyan mission is set above the older establishment of the London Missionary Society. This appears particularly in the chapter on Samoa. This iny kingdom has occupied a large place in diplomatic entanglements; it has brought great nations to the edge of war; it has engaged the best efforts of those who would keep the peace of the world. Yet in this chapter we find little but an uninteresting and partisan narrative of the unimportant squabbles between two missionary organizations. The bibliography under a topical arrangement is pretentious but unsatisfactory, many of the standard works on the South Sea being omitted. WILLIAM CHURCHILL.

EDWARDS, CAPT. EDWARD, AND GEORGE HAMILTON. **Voyage of H. M. S. "Pandora" Despatched to Arrest the Mutineers of the "Bounty" in the South Seas, 1790-91.** Being the narratives of ——. With introduction and notes by Basil Thomson. 177 pp. Map, index. F. Edwards, London, 1915. 6s. 9 x 6.

Great credit is due Basil Thomson, than whom none is better qualified, for the republication of these long-inaccessible narratives of grim adventure in the South Sea. The voyage of the *Pandora* is a necessary complement to the story of the mutiny of the *Bounty*. But its interest by no means ceases there. In these brief narratives, particularly in that of the appreciative surgeon, Hamilton, we find the first description of Tutuila, the American possession in Samoa. The introduction with which Mr. Hamilton prefaces the volume is an excellent commentary on the voyage and on its purpose and should serve to revive interest in the *Bounty* and her mutineers. His notes are accurate, as far as they go, but it is to be regretted that he did not see his way clearly to the identification of all the landfalls by the names now standardized.

FISCHER, H. W. **Ethnographica aus Süd- und Südwest-Neu-Guinea.** Ills., bibliogr. pp. 37-145. J. W. VAN NOUHUYS. **Der Bergstamm Pĕsĕgĕm im Innern von Niederländish-Neu-Guinea.** Maps, diagrs., ills. pp. 1-33. Arts 2 and 1 respectively of Livr. 1 of Vol. 7 (Ethnographie) of "Nova Guinea: Résultats de l'expédition scientifique néerlandaise à la Nouvelle-Guinée en 1907 et 1909 sous les auspices de H. A. Lorentz." E. J. Brill, Leiden, 1913. 12½ x 10.

This first instalment of the ethnographical results of the Lorenz expedition in Dutch New Guinea gives us two valuable reports of notably various treatment. The first is the record made by Nouhuys of the mountain tribe of the Pesegem; the second is the carefully elaborated synoptic list of ethnica collected by Fischer in south and southwest New Guinea. The latter will fit immediately into the mass of similar material and will be found of great value to students who make their researches in the dissemination of various objects and designs as establishing the extent of culture planes. The report by Nouhuys is of great narrative interest. No satisfactory results have yet been reached in the attempt to disentangle the interlacing of diverse races in this great island. Provisionally the coast dwellers have been distinguished as Papuans and Melanesians. The latter designation is unsatisfactory, for it is based upon linguistic considerations for which a more satisfactory explanation may be given. The designation Papuan is confessedly artificial and temporary, for it is clear that there is no uniformity of race among the peoples thus noted. The folk of the interior mountains are but just coming into knowledge, and we lack material whereby to assign them to affinity with any of the coast tribes, but probably they will become established as differing among themselves in the mountain habitat and seldom associable with coast dwellers. Nouhuys distinctly states that the Pesegem are not pygmies; therefore they are not to be associated with the pygmy race found in the mountains not far east by the British ornithological expedition. The expedition was in touch with these mountaineers for but a few hours altogether. The report must therefore be regarded as essentially provisional, but it is an excellent record of observation.

WILLIAM CHURCHILL.

SPEISER, FELIX. **Südsee-Urwald Kannibalen: Reise-Eindrücke aus den Neuen Hebriden.** v and 308 pp. Map, ills. R. Voigtländer, Leipzig, 1913. Mk. 8.50. 9 x 7.

The author modestly disclaims for this volume any higher position than that of a collection of impressions of random voyaging. Yet in the paucity of the literature upon Melanesia these sketches are of great value. Speiser traveled quite at random through the New Hebrides; his southern limit is set at Noumea, the capital of Ne Calendonia, and to the north he reached the rarely visited island of Ticopia. Most of h voyaging was done from island to island in cutters and, in this lazy drifting, he w able to see many little-visited islands and to hear the story of life on each from th traders and labor bosses who know the savage of the New Hebrides with far mor practical information than do the missionaries. The sketches do not pretend to reac a high grade of geographical value, but they are a fresh record of things seen withou preconceptions. His record of impressions is vivid and accurate, and his errors o interpretation are unimportant to the casual reader and may readily be corrected by th student acquainted with Melanesian custom. The volume is the most important con tribution to the general geography of the New Hebrides which has yet appeared.

WORLD AS A WHOLE AND LARGER PARTS

Boero, J. A. **Geografia de América, adaptada a los nuevos programas de los colegios nacionales y escuelas normales.** 29th edit. iii and 439 pp. Maps index. Angel Estrada y Cia, Buenos Aires, 1915. 5½ x 8.

This work by an Argentine normal school professor, author of a series of geographies, calls for two comments: it conceives of America properly, as the twofol continent, North and South America; and it treats the United States with real kindness and sympathy. "The United States, which stands forth today as the most prosperous and most active nation in the world, has inherited the practical, enterprising, and persevering spirit of the northern Europeans together with the vastest, richest, and most beautiful territory of all America." Nor is that an isolated passage.

Many maps by W. and A. K. Johnston, which would be better if a little larger and more legible, illustrate the admirably printed book. Of minor details some criticism may be made. Reindeer are not native to North America, nor is the spring and summer temperature of Newfoundland regarded as "delicious." It is not quite orthodox to make the "trade winds from the Atlantic blow against the eastern crests of the Rockies, leaving there a great number of glaciers which feed the great tributaries of the Mississippi;" nor to put "the largest transatlantic ships" on the waters of lake Michigan. It is amusing to read that the climate of British America is so severe that it "limits the forests in the far north to little trees and *reindeer moss!*"

Mark Jefferson.

Meiklejohn, J. M. D. **A Short Geography, With the Commercial Highways of the World.** 34th edit. 190 pp. Maps, index. Meiklejohn & Son, London, 1913. 1s. 7½ x 5.

Meiklejohn, J. M. D. **A New Geography on the Comparative Method.** 41st edit., revised. liv and 578 pp. Maps, index. Meiklejohn & Son, London, 1913. 4s 6d. 7½ x 5.

Meiklejohn, J. M. D. **The British Empire: The Geography, Resources, Commerce, Land-ways and Water-ways of the British Dominions Beyond the Seas.** 8th edit. viii and 351 pp. Maps, index. Meiklejohn & Holden, London, 1907. 3s. 7½ x 5. 1913.

Meiklejohn, J. M. D. and M. J. C. **A School Geography, With Special Reference to Commerce and History.** 9th edit., revised. viii and 416 pp. Maps, index. Meiklejohn & Son, London, 1913. 2s 6d. 7½ x 5½.

Professor Meiklejohn makes a statement in his "A New Geography" which holds good to some extent in all four books. He writes: "The key-note of the whole book is that statement of Humboldt's: 'Only maps that appear empty take a firm hold on the memory;' and I have tried to sketch the outlines [printed in large type] in a few clear and firm strokes, while the learner may select for himself those facts given in the notes [in small type] which may appear to him most interesting." In the small type are given descriptions and details associated with the main subject considered.

To show that his method is good psychology in teaching, Meiklejohn says: "The symbol of association is a spider's web, any point in which may be reached from any other point along the connecting lines. In these subordinate paragraphs my aim has been to introduce as many hooks, burrs, and tentacles as possible, so that something is sure to stick to the memory of even the most careless." In the make-up of these books, however, there is an objection to this small type—it is so small that it strains one's eyes.

The control of the inorganic over the organic is brought out only to a limited extent.

Wilbur Greeley Burroughs.

RAL MOLINA, ALFONSO DEL. **Geografia general y descriptiva de las partes del mundo.** 464 pp. Maps, ills., index. Librería de los Sucesores de Hernando, Madrid, 1914. 6 pp. 6 x 9½.

A good example of old-fashioned geography, with all and more of the deficiencies the class. One instance will suffice: The ''eastern'' region of Peru has some very tle towns, Iquitos, Puerto-Bermúdez, Cuzco, and Puno!

AINE, G. R. **Environment: A Natural Geography.** 226 pp. Maps, ills., index. Ralph, Holland & Co., London, 1914. 1s. 9d. 7½ x 5.

The author says that the basic principle underlying the teaching of geography is the fluence of environment upon man. This little volume is a successful attempt to ustrate this principle, so far as it can be worked out in an elementary book. The thor divides the world into four main regions—polar, cool temperate, warm temperate, d hot—and describes the influence of environment upon life conditions, human and herwise, in smaller regions within the main divisions. For example, there are four apters in the section on cool temperate regions, dealing respectively with the equable nds, lands with cool winters and low rainfall, the extreme lowlands, and the elevated nds. Again, in the section on the hot regions, there are five chapters containing dis-ssions of rainless deserts, the tropical monsoon lands of Asia, equable hot lowlands, pical and semi-tropical highlands, and the islands of the Pacific Ocean. In the pendix is a discussion of the causes of the origin and development of towns. A mber of small maps show the various natural regions of the continents. There are so illustrations which should serve forcibly to impress youthful readers with matters scussed in the text. AVARD L. BISHOP.

OSBORN, H. F. **Review of the Pleistocene of Europe, Asia, and Northern frica.** Maps, ills. *Annals New York Acad. Sci.*, Vol. 26, 1915, pp. 215-315.

Hanc quam videtis terrarum orbis tabulam descripsit delineavitque Ricardus de Hald-gham, sive de bello dictus A. S. circa MCCC. Published for the proprietor by Edward anford, Ltd., London, 1872. [Gift from Dr. E. L. Stevenson of the Hispanic Society.]

Atlas of the world [in Egyptian characters]. 10 double pls. Survey Dept., Cairo. 913?]

MATHEMATICAL GEOGRAPHY

GENERAL

LEICHER, HEINRICH. **Statistik.** Vol. 1: **Allgemeines; Physikalische und Bevölkerungs-Statistik.** (Series: Sammlung Göschen.) 148 pp. Index. G. J. Göschen, Berlin, 1915. 90 pfg. 4½ x 6½.

Much suggestive material is herein developed. The method of collecting statistical ta is not always so obvious as some are inclined to believe. One striking yet simple atement calls attention to the fact that only when data are gathered according to me well-thought-out and definite plan are they likely to have a real value. The llection of miscellaneous data without classification should not be included under the eading ''Statistics.''

In formulating a questionnaire all questions should be short and pointed. Questions hich require answers that will serve to check up other answers, yet whose real purpose not apparent to the one reading them, often increase the efficiency of the question-aire.

One is cautioned against averaging figures of decidedly different weight. Likewise is dangerous to compare and contrast averages which are generalizations of widely ivergent figures. Various simple formulæ are presented as aids to arriving at proper verages. The significance of graphic representation of statistics is strongly empha-ized. Several styles of graphs are illustrated. That graphs, to be of value, must be asy to read and easy to interpret becomes almost axiomatic. A general discussion of he method, organization, and technique of statistics, a special section devoted to popu-ation statistics and one to physical statistics, i.e. those of the inorganic earth, form the ain divisions of the book. E. VAN CLEEF.

SURVEYING AND GEODESY

RAFF, K. **Grundriss der geographischen Ortsbestimmung aus astronomischen Beobachtungen.** viii and 210 pp. Ills., index. G. J. Göschen, Berlin, 1914. Mk. 8. 9½ x 6½.

The first half of this little treatise on practical astronomy consists of two chapters n (1) the astronomical and trigonometrical principles involved and the manipulation of tables, and (2) a description of the instruments employed and their use. The second half consists of four chapters on approximate methods for altitude (latitude), time, longitude, and azimuth; more rigorous methods for time correction and latitude; methods of measuring geographical longitude and azimuth; and special methods for determining nautical positions. In appendices are given typical solutions of the different problems which arise and the usual reduction tables and constants.

The author addresses himself particularly to geographers and travelers and his aim has been "to give primary consideration to practical applications, without, however, hesitating to go into the astronomical principles involved wherever he deems it desirable, while, at the same time, reducing the mathematical skeleton to a minimum." The book, though short and condensed, is complete and well written. In order to make it more practical and useful, a chapter might well have been added on the actual field work, outfit, programs of work, care of instruments, etc. James Gordon Steese.

Raymond, W. G. **Plane Surveying for Use in the Classroom and Field.** 589 pp. Maps, ills., index. American Book Co., New York, 1914. $3. 7 x 4½.

A new edition, in pocket form for use in the field, of the author's well-known textbook on surveying. Instruments, their adjustments and corrections, as well as the theory of errors applying to each, with easy working formulæ, are the subjects first taken up. This part has been entirely rewritten for the new edition. The author says that the collimation adjustment for the transit is herein correctly explained for the first time in a textbook.

The book is primarily for the land surveyor, with a discussion of methods, computations, problems, a chapter on the stadia, and a section on the judicial functions of surveyors and other legal aspects in the bearing of surveys upon private property. Topographic surveying receives a general treatment sufficient for the classroom, and the author refers the student to a list of publications for those wishing to follow the methods of the geological and geodetic surveys. City surveying is treated to secure the precision of one in fifty thousand. The measurement of velocities, discharges, and weir flows is treated under hydrographic surveying. A very full chapter deals with mine and underground surveying and mapping.

The meridian, latitude, time, the solar instrument, and public land surveys are discussed, as well as office instruments, including the pantograph, slide rule, and planimeter. The theory of the latter is explained without the use of the calculus.

There is a sectional view of the transit in colors with eighty-one named and numbered parts. The tables at the end appear to cover very well the subjects treated in the book. C. A. Seoane.

Schück, A. **Der Kompass. II: Sagen von der Erfindung des Kompasses; Magnet, Calamita, Bussole, Kompass; Die Vorgänger des Kompasses.** 57 pp. IIa: **Tafel 47-79 und Verzeichnis derselben.** 30 pp. The author, Hamburg, 1915. 14½ x 11½.

A short review of Part 1, published in 1911, was printed in the *Bulletin of the American Geographical Society* (June, 1915, p. 465). Part 2, which is really the main work, contains a thesis on the origin and development of the mariner's compass, covering fifty-eight large pages and about four hundred additional cuts, grouped into thirty-three plates, with descriptive matter which completes the catalogue begun in Part 1. It is unfortunate that this monumental work, representing so much research, should not have been published in handier form and in good binding.

The author says that no account of the actual invention of the compass has been found, but four stages in its development may be traced: (1) the discovery of an ore having magnetic properties; (2) the discovery that steel or hardened iron can be made magnetic; (3) the discovery that the magnet or magnetized iron possesses the property of indicating a fixed direction, in other words, is pole-seeking; and, (4) the application of this knowledge by the use of a magnetized iron needle as a compass.

References to lodestones and magnetism are found in the traditions and early writings of many countries. The oldest records of the compass refer to China as its origin. The author gives a long account of all records, fables, references, etc., which attribute the compass to the Chinese. He concludes that whatever the Chinese may have known about magnetism, they certainly knew nothing about its practical use in navigation. From his own observations and investigations in the East many years ago, he found that the Chinese, even then, were not using the compass with much success.

The compass tradition in Europe is next discussed. The first mention of it in early writings is traced and the claims of the different nations as to its invention are balanced. The author disposes of the mythical Flavio Gioja of Amalfi and his reputed invention of the compass in the fourteenth century. He concludes that the polarity of the lodestone or magnetized iron was independently observed in several countries and no one nationality or association can justly claim its complete development. The same may be said of the controversy as to whether the Europeans or the Arabs had priority of invention or use. ''The compass is a foundling and owes its existence and its first development certainly to seafaring men and after them to the labors of various instrument-makers.''

A philological discussion of the words magnet, calamita, boussole, and compass follows. All these names were variously used to indicate what eventually became the mariner's compass as we know it today. Citations are made from the languages of practically all seafaring peoples, both ancient and modern. The author concludes with a detailed account of the crude instruments which preceded the compass, beginning with the first floating lodestones by means of which polarity was discovered.

The cuts present a most elaborate pictorial history of the subject. Each phase is represented by numerous examples, usually from several different countries, showing the parallel development. By following them chronologically, we may trace the entire history of the compass. For example, as regards the marking of the points: The compass card originated from the old wind-roses, and the earliest cards had only eight points corresponding to the eight principal winds. The points were marked with the initial letters of the names of the winds, the ''L'' for east being replaced by a cross. The arrow at the north point became intertwined with the ''T'' *(tramontano)* to develop into the familiar fleur de lis, the old initials were dropped, but the cross at the east point was retained till comparatively modern times. Then the card was reinitialed with the so-called points-of-the-compass designations, east, southeast, etc., instead of the names of the winds. In a similar manner one may trace the development of the needle from a single one of various shapes to the number of parallel needles now in use. The cap, bowl, and supporting mechanism are also profusely illustrated. The collection is completed by some illustrations of the most improved instruments and devices.

James Gordon Steese.

PHYSICAL GEOGRAPHY

General

Berget, Alphonse. **The Earth: Its Life and Death.** Translated by E. W. Barlow. xi and 371 pp. Index. G. P. Putnam's Sons, New York, 1915. $1.75. 8½ x 6.

The volume aims to trace the history of the earth from its birth according to the nebular hypothesis, through its infancy according to the tetrahedral theory, to its death some millions of years hence, and ultimate resurrection to a new life, billions of years later, through a collision of suns in interstellar space. As geographers, we are primarily interested in the earth at its present stage of development, with possibly a secondary interest in certain portions of its past history written in the geological record. Concerning the first, we find in the book chapters on the form and size of the earth, on its magnetism, electricity, and radioactivity, on tides and waves, on oceanic and atmospheric circulation, and on the forces which wear down and build up land masses. As to the second, the remote geological history of the earth is traced in broad outline, and more attention given to earth movements and recent seismic phenomena.

The book has two serious defects: Unproved theories are frequently set forth as definitely ascertained facts, even when, as occasionally happens, the theory has been long abandoned by most scientists as extremely improbable; and well-established facts in the earth's past history have escaped the author's notice, and in their stead the fanciful notions of a bygone day find a place in his picture of earth evolution. Thus we read that in Archean time ''the rocks formed were still at a high temperature and the primitive atmospheric condensation brought down scalding liquids'' (p. 37), while terrestrial life became possible when the temperature of atmosphere and ocean was lowered to about 140° F. (p. 38). Not until the end of the Tertiary era was the temperature lowered sufficiently for glaciers to make their appearance (p. 45). Ultimately the whole of Central Europe and North America were buried under the ice (p. 46). Seismic disturbances result when the core of the earth shrinks away from the crust or volcanoes emit lava, both operations leaving vacant spaces into which the unsupported crust ultimately falls, producing shocks; also when currents in the liquid core wash against downward projections of the crust and agitate them (pp. 201-202). All of which makes interesting reading, but one wonders how it came to be published in the garb of science.

D. W. Johnson.

HOLMES, ARTHUR. **The Age of the Earth.** (Series: Harper's Library of Living Thought.) xii and 196 pp. Ills., index. Harper & Bros., London & New York, 1913. 7 x 4½.

The table of contents includes the following chapters: (1) The Time Element and Its History; (2) Time and Tide in the Solar System; (3) Astronomical Considerations; (4) Work of Denudation; (5) Salinity and Age of the Ocean; (6) Sedimentation and Geological Time; (7) Radioactivity; (8) Thermal Energy of the Sun; (9) Thermal Energy of the Earth; (10) Radioactive Minerals and Their Ages; (11) Review of the Evidence.

This little volume is not so ambitious as its title and table of contents might indicate, yet for a brief and readable résumé of the time problem it is a welcome contribution. About half of the work is given to radioactivity and its application to geological problems, an especially timely and useful topic, since few geologists are able to keep abreast of this line of work. The author inclines towards an enormous estimate of the earth's age and believes that eventually a study of radioactivity will afford an absolute, instead of the present relative, time estimate of the major periods as well as of the total age of the earth. F. V. EMERSON.

GEOLOGY AND GEOMORPHOLOGY

CASE, G. O. **Coast Sand Dunes, Sand Spits, and Sand Wastes.** xiii and 162 pp. Ills., index. St. Bride's Press, London, 1914. 5s. 7½ x 5.

Sand dunes are so abundant along our Atlantic and Pacific coasts, along the shores of our Great Lakes, in many parts of our arid West, to say nothing of their presence over many inland areas and along highways of travel, that they have already become a source of trouble as they march across country burying houses, forests, orchards, railroads, or anything else in their path. It is only recently that the problem of fixing dunes has assumed any importance in the United States, though the subject has received attention in Europe for sixty years.

This little book is intended to show the beneficial results which follow when man works with nature to accumulate and fix the inblown sands in such a way as to provide a permanent protection to the coast. Sand dunes may be fixed in three ways: (1) by planting a belt of suitable grasses and shrubs just above high-water line; (2) by building, or helping nature to build, an embankment of earth or sand; and (3) by constructing a row or series of rows of open-work fences. Sandy wastes are easily converted into pine woods, which may become an important commercial asset.

COLLIER COBB.

FRECH, FRITZ. **Allgemeine Geologie. III: Die Arbeit des fliessenden Wassers.** Eine Einleitung in die physikalische Geologie. 3. erweiterte Auflage von ''Aus der Vorzeit der Erde.'' (Series: Aus Natur und Geisteswelt.) 124 pp. Map, ills. B. G. Teubner, Leipzig, 1914. Mk. 1.25. 7 x 5.

Simple and popular story of the work of land waters, not including the work of ice. The chief value to the teaching geographer is in the examples cited, serviceable for lectures and class-room discussions. Thus to forests are ascribed their full efficiency in preserving land surfaces, and the following striking case is given,—from 1471 to 1776 the French southern Alps lost almost three-fourths of their cultivable ground, with corresponding loss of population.

Referring to one topic out of many: The classification of waterfalls is unsatisfactory, being both incomplete and illogical, as, for example, in assigning all the falls of eastern America to a glaciated-plateau class, typified by Niagara. Regarding falls from hanging valleys in glaciated regions, the commonly accepted explanation is given, but the term, now so generally used with us, is avoided. Half the volume is devoted to surface streams, and the remainder to ground water, under the heads karst and cavern formations, springs, and landslips. The half-tones and other illustrations are numerous but of inferior execution. A. P. BRIGHAM.

DAVIS, W. M. **A Shaler Memorial Study of Coral Reefs.** Ills. *Amer. Journ. of Sci.*, No. 237, Vol. 40, 1915, pp. 223-271.

FALCONER, J. D. **Land Forms and Landscapes.** Maps, ills. *Scott. Geogr. Mag.*, Vol. 31, No. 2, 1915, pp. 57-71; No. 3, pp. 143-151; No. 4, pp. 169-180; No. 5, pp. 244-253; No. 8, pp. 393-406.

GRATACAP, L. P. **A Popular Guide to Minerals.** 330 pp. Map, ills., index. D. Van Nostrand Co., New York, 1912. $3. 9 x 6.

LOPERFIDO, A. **Le cause sismiche.** Bibliogr. *Riv. Geogr. Ital.*, Vol. 22, 1915, No. 7, pp. 321-334.

Néoustroueff, S. **Sur les combinaisons des sols dans les plaines et dans les ays montagneux.** *La Pédologie,* Vol. 17, 1915, No. 1, pp. 62-73. Petrograd.

Platania, G. **Marmitte dei giganti di erosione marina.** 7 pp. Ills. *Pubbl. ell' Ist. di Geogr. Fisica e Vulcan. della R. Univ. di Catania No. 2.* Rome, 1915.

Wilmore, Albert. **A First Book of Geology.** (Series: First Books of Science.) ii and 141 pp. Ills., index. The Macmillan Co., New York, 1914. 50 cents. 7 x 5.

Hydrography and Oceanography

ahde, Adolf. **Meereskunde.** (Series: Bücher der Naturwissenschaft, herausgegeben von S. Günther.) 190 pp. Diagrs., index. P. Reclam, Jr., Leipzig, 1914. Mk. 1.75. 5½ x 4.

This little book shows how well a great topic may be simplified and condensed and ts essentials presented in a way to interest all intelligent readers. In less than 18,000 ords Dr. Pahde gives a history of the progress of oceanography, and the contributions ade to it by various men and nations; describes the sea basins and tells what is nown of their floors, relief, deposits, tides, currents and other movements, thermal onditions, etc. Dr. Pahde's maps, in colors, of currents and surface temperatures, his lack-and-white maps, diagrams, tables, and index are all well done and very helpful. book so efficient and charming as this deserves to be well known in our country.

Meteorology and Climatology

euhaus, E. **Die Wolken in Form, Färbung und Lage als lokale Wetterprognose.** 48 pp. With separate case of plates. O. Füssli, Zürich, 1915. Fr. 15. 13½ x 10.

The enthusiasm of the author of this new work on clouds is splendid and also ontagious. He loves his Swiss mountains and his clouds. He knows his cloud types nd their formation, their colors, their significance. He is at home in his subject, as oo few of us are. His object is clearly before him. It is to make the results of his bservations of practical use to others, in helping them to make their own local weather orecasts.

A forester, who necessarily spends much time outdoors, Dr. Neuhaus has devoted imself for years to a very intimate study of cloud forms and their meanings. It is atural that his results are chiefly of local interest, for clouds in mountain regions are eculiarly susceptible to local influences. Yet no one can read the text of this volume ithout finding in it many points of interest; and the remarkable cloud photographs, xquisitely reproduced, are real works of art.

Our author has gone into great detail in his scheme of cloud observation and ecord. Blank tables are given for keeping the results systematically. A color scheme, ormulæ, symbols, etc., are presented for the instruction and use of other observers. rankly, the details of this scheme seem to us too elaborate and too minute for general se. We feel that those who are interested in local cloud observation will usually refer to work out their own scheme. But the work cannot fail to inspire those who tudy it with an interest and an enthusiasm for cloud observation. The volume clearly hows what one painstaking and patient observer may contribute to meteorological cience. Dr. Neuhaus uses his own descriptive terms for his different cloud forms, but he general equivalents in the international classification are shown in a comparative able.

R. DeC. Ward.

Reed, W. G. **Note on the Effects of Raingage Exposures.** Map. *Monthly eather Rev.,* Vol. 43, 1915, No. 7, pp. 318-322.

HUMAN GEOGRAPHY

General

Ditzel, H. **Die Weltbevölkerung.** Diagrs. *Geogr. Anzeiger,* Vol. 16, 1915, o. 10, pp. 294-296. Gotha. [An evaluation of the accuracy of population estimates f the continents (North and South America counted as one) from 1804 to 1910. Two raphs illustrate (1) the mean rate of growth according to these estimates, and (2) the robable rate of growth based on the estimates of the last decades, which are more rustworthy because of census enumerations. The untrustworthiness of earlier estimates s illustrated by the first curve for Africa, which, starting at 70,000,000 in 1804, ncreases to 205,000,000 in 1880, and then drops to 130,000,000 in 1910. The probable alues for these three years, as illustrated by the second curve, are 60,000,000, 10,000,000 and 155,000,000, exhibiting a normal, steady growth.]

Anthropology and Ethnography

Du Bois, W. E. B. **The Negro.** (Series: Home University Library.) 254 pp. Maps Henry Holt & Co., New York, 1915. 50 cents. 6½ x 4½.

Doctor Du Bois here presents the main known facts in the history of the negro. Many of these facts should have been better known long ago, as they concern a race numbering about one-sixth of human kind, with nearly half the world as the theater of its achievements, misfortunes, and tragedy. The author most emphasizes the terrible handicap that, for centuries, other races have imposed upon the negro, and he proves his case, though his selection of data is not always critical and some of his statements of fact are open to criticism. He is mistaken in specifying (p. 159) the cocoa plantations of the Portuguese islands in the Gulf of Guinea and the "Congo Free State" as centers of "actual slave trading." Portuguese methods of dealing with field laborers on these plantations is a scandal which will some day be ventilated and the nuisance abated; but slave trading and its forerunner, raiding for slaves, have been practically wiped out everywhere in Africa. The last stronghold of slave raiding—in Wadai—was suppressed by the French in 1909-1910. On the whole, the book is an able exposition of Doctor Du Bois' theme, and he deserves all the greater credit because it is very difficult to treat so large a subject in space so limited.

Franke, Carl. **Die mutmassliche Sprache der Eiszeitmenchen in allgemein verständlicher Darstellung.** 2nd edit. 112 pp. Buchhandlung des Waisenhauses, Halle a.d.S., 1913. Mk. 3. 9½ x 6½.

This work is noteworthy for the facts it offers toward the study of a theme which calls for careful research—the evolution of the speech faculty in man. From the rugosities on the lower mandibles, preserved from the glacial epochs, comparative anatomists have derived the conclusion that man of that period was incapable of human speech. This is an essay toward the establishment of the beginning and development of the muscular ability to frame the closures of the buccal cavity. It is the facility in the formation of such closures which endows man with a more or less rich consonantal modulation of the open-throated vowel sounds and thereby sets human speech above the animal cry as a means whereby thought may be communicated. This theme of the evolution of speech is yet so new that none of the two or three of us who are working upon it may feel sure that he has hit upon the right method; but it is important that work is being done and any method in this beginning stage is quite as valuable as any other. This is an important contribution to the theme and should serve as a stimulus to further inquiry. William Churchill.

Heilborn, Adolf. **Allgemeine Völkerkunde.** Vol. 1: **Feuer, Nahrung, Wohnung, Schmuck und Kleidung.** viii and 136 pp. Ills. Vols. 2: **Waffen und Werkzeuge. Industrie, Handel und Geld, Verkehrsmittel.** viii and 116 pp. Ills. (Series: Aus Natur und Geisteswelt.) B. G. Teubner, Leipzig, 1915. Mk. 1.25 each. 7 x 5.

This work is a revised sketch of an earlier volume (1878). The author puts weight on the development idea proper to the naturalist, in distinction from the anthropologist, who looks more at the systematic position of man among the primates. The culture of all times can be rightfully studied only in the light of its evolution. Accordingly the geographical-historical viewpoint is definitely assumed. "Ground and climate determine more than all else the weal and woe of peoples." Nature and culture peoples find their essential difference in the way in which thy are linked to the earth. Culture is the gradual emancipation from the contingencies of nature by development and inheritance through generations.

The development of culture in man is regarded as the natural function of environment. Apparent approval is accorded to a sentiment quoted from Frederick the Great,—"All culture proceeds from the stomach." Material and intellectual culture are not to be put in sharp contrast. Material culture is the ground of the intellectual, and, on the other hand, intellectual progress is generally accompanied by material achievements. These observations occur in an opening chapter on the nature and evolution of culture.

Other parts of the first volume deal with fire, food, habitation, and dress. The second volume has chapters on weapons, handicrafts, trade and money, and on means of transportation. The work is quite fully illustrated and each volume contains a bibliography. A. P. Brigham.

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THE GREAT RUSSIAN RETREAT[1]

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The two most important military developments in 1915 were the Russian retreat from the heights of the Carpathians to the Pripet marshes and the conquest of Serbia by the Teutonic allies. In the present article attention is directed to the first of these movements with the object of illustrating the strategic value of landforms to the Russian armies during one of the most skilfully conducted retreats in military history.

General Geographic Relations. A map (Fig. 1) of the area covered by the retreat will enable us to appreciate some of the broader geographic problems involved in this great movement. First, let us note the position of the Russian armies on the last day of April, 1915, when the German guns along the Dunajec and Biala Rivers opened the campaign which was to drive the Slavs back across a belt of country measuring more than 250 miles in maximum width. From the Baltic Sea north of Memel the defensive line of the Russians ran eastward toward the Dubissa River, thence southward along or near that stream to its junction with the Niemen. Beyond this point the Russians had been able to advance from behind their main protective screen of the Niemen-Narew barrier of river and marsh and hold the Germans at bay in the swampy forests farther west. South of the Vistula the Russians remained secure behind the almost continuous trench formed by the valleys of the Bzura, Rawka, Pilica, Nida, Dunajec, and Biala Rivers. Near Cieźkowice on the last named stream the Russian line left the valley and, turning southeast over the foothills, crossed the main crest of the Carpathian Mountains and followed their southern slope eastward beyond the Lupków Pass. Recrossing thence to the north side of the range, the line followed the Stryj valley toward its junction with the Dniester and the northern side of the Dniester gorge to the Rumanian border.

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[1] This is the sixth in a series of articles on the geographic aspects of the war, which appeared in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 175-183, 265-277, 358-361, 442-444, and 526-529, respectively. For a further account of the topographic features described but briefly in the present article, the reader should consult the second paper of the series.

To state the position of this great battle front is alone sufficient to emphasize the importance of river, marsh, mountain, and gorge as defensive screens against enemy attacks. Even where the Russian line was not immediately associated with some striking topographic barrier, as for example the segment between the Niemen and Vistula Rivers, the main defensive position was usually along such a barrier but a short distance in the rear of the actual front. The Teutonic armies had for months been facing the series of obstacles named above, and repeated furious assaults against first one barrier and then another had ended in failure. What was there back of the barriers for which the Teutonic armies were fighting so strenuously, how did these armies finally break through the opposing obstacles, and to what extent were they successful in achieving the purposes for which they fought? Let us see what points of geographic interest are involved in the answers to these questions.

Back of the artificially entrenched and naturally protected Russian line lay Warsaw, a fortified city guarding one of the few bridge crossings of the Vistula, a railway center of the highest importance, and a political prize of the first magnitude, for the capture of which the German generals in repeated drives had vainly sacrificed hundreds of thousands of their best troops. Two direct assaults on the city failed, the first almost at the city gates, the second at the defensive line of the Bzura and Rawka Rivers. There remained the possibility of isolating the city and forcing its surrender by severing its railway communications. It will be seen from the map (Fig. 1) that Warsaw forms the apex of an important system of railways converging westward from all parts of the Russian Empire. For the sake of simplicity the most important lines alone are represented, and of these the line from Petrograd through Dvinsk, Vilna, Grodno, and Bielostok, and the lines from the east and south passing through Brest-Litovsk, Kovel, and Ivangorod were absolutely essential to the defense of Warsaw and to the supply and munitionment of the main Russian defensive positions which these railways paralleled for long distances. Repeated attempts to sever the railway southeast of Warsaw ended in failure when the Austrian armies were defeated in their endeavor to advance through the marshy forests south of Lublin and Cholm early in the war and the Austro-German armies vainly attacked the great trench of the middle Vistula River. Similar attempts against the Petrograd-Warsaw line failed because the Germans were unable to cross the middle Niemen between Kovno and Grodno or the Narew-Bobr line of river and marsh farther southwest.

The Teutonic armies were sadly in need of a position for the coming winter which would have immediately behind and parallel to it a good railway line. This would enable them to shift their gradually decreasing supply of troops from point to point with the rapidity necessary to meet an enemy offensive or to bring overwhelming numbers to some particular

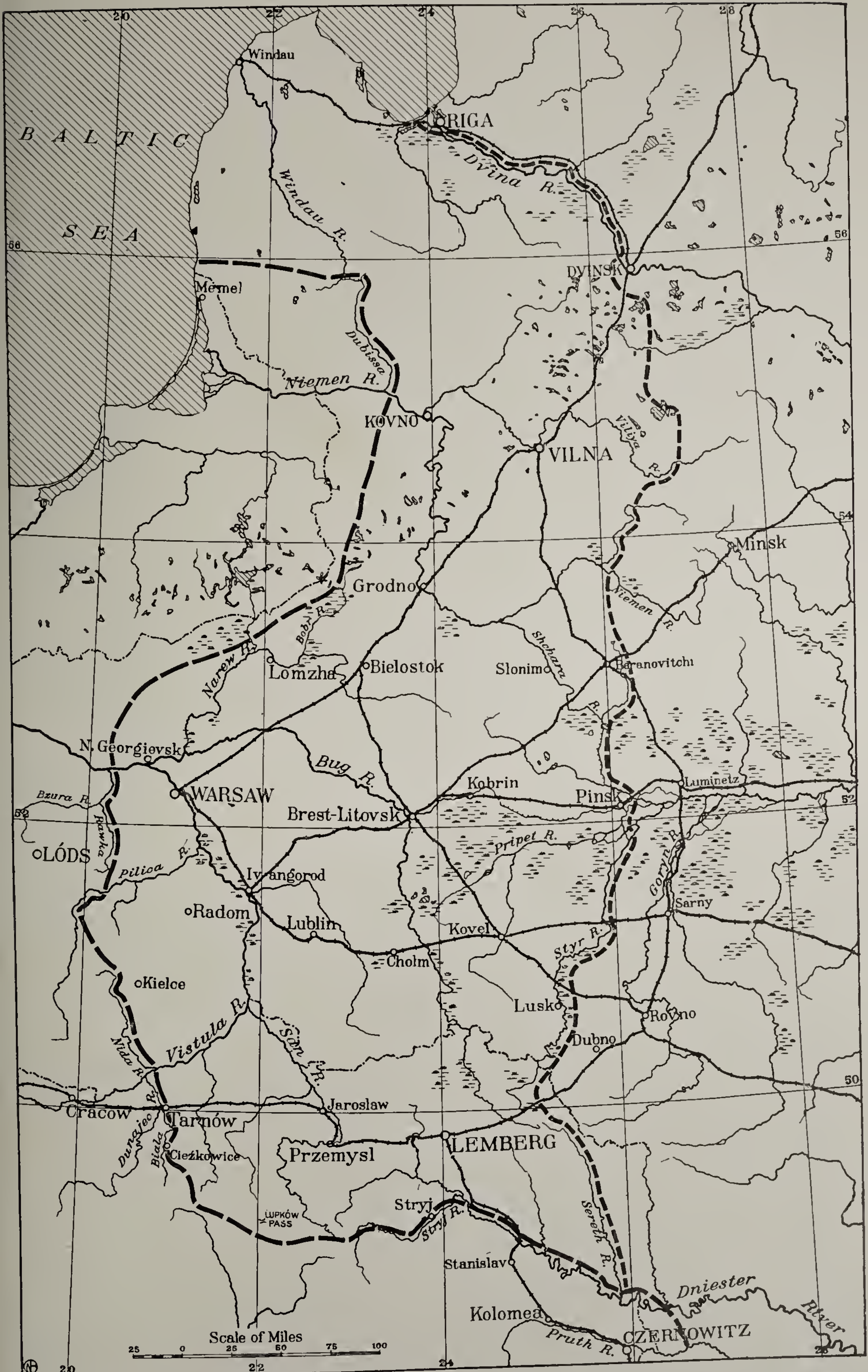

FIG. 1—General map showing the extent of the Russian retreat. Long dashes show the Russian position in April, 1915; short dashes, the position at the end of the retreat. Scale, 1:5,700,000.

point where a Teutonic offensive was contemplated. It would also permit the munitionment of their troops so rapidly as to give them a great superiority in artillery duels. At the same time the Russian loss of the railway would decrease the mobility of their armies and place them at a fatal disadvantage in bringing to their front supplies of all kinds. If the railway loop Vilna-Bielostok-Warsaw-Ivangorod-Lublin-Kovel-Rovno could be broken near its apex and the fortifications of Warsaw and Ivangorod taken, the Russians would be forced back to the loop Vilna-Bielostok-Brest-Litovsk-Kovel-Rovno. The Austro-German armies then might hope to break the apex of this blunter loop at Brest-Litovsk and so push on to the nearly north-south line through Riga-Dvinsk-Vilna-Baranovitchi-Luminetz-Sarny-Rovno and its continuation to Lemberg-Kolomea-Czernowitz. Entrenched on the eastern side of this great line of steel stretching unbroken from Riga on the Baltic coast to Czernowitz near the Rumanian border the Teutons could bid defiance to the Russians operating at the isolated ends of widely separated railways in a difficult country where neither railways nor good wagon roads paralled their extended front.

But far more important than any of the above-mentioned prizes back of the Russian line was the Russian army itself. Wars are won by destroying the enemy's fighting forces, not by winning cities, railways, and good defensive positions. In the retreat which would follow the forcing of the Russian line the Teutons hoped to surround and destroy large sections of the Czar's armies. Unless this principal object of warfare was achieved, the other gains might not repay the fearful cost of a great general offensive.

We must not lose sight of one further prize of a political nature for which the Teutons were contending, for political events may profoundly influence or even determine military campaigns. Back of the Russian line lay the Balkan states, politically if not geographically. An Austro-German victory involving the conquest of Poland would profoundly impress the wavering Balkan monarchs and might bring one or more of them into the fight on the Teutonic side. Russia herself might be so sorely bruised as to forsake her allies and conclude a separate peace. Failing this, the Russian armies could at least be temporarily paralyzed, thus permitting the transfer of large bodies of Austro-German forces from the eastern theater of war to the Franco-British and Italian fronts, where their aid was sorely needed. From the military standpoint the possible results of a great Teutonic offensive certainly justified expenditure of the hundreds of thousands of men already sacrificed in earlier endeavors to break through the topographic barriers protecting the Russian railways and the great hosts of Austro-German troops which would undoubtedly perish in renewed attempts to achieve success.

Why was it that the Russian position along the eastern wall of the Dunajec and Biala valleys, protected by a natural moat of such formidable character that Teutonic armies had suffered repeated defeats in earlier efforts to cross it, was finally broken by the assault which began the last of April? The answer to this question is largely geographical, and to appreciate it the reader should turn to a map of Eurasia showing principal railway lines. It will there be seen that Russian communication with the outside world is effected mainly through the five following routes: westward through the Baltic, or by way of Austrian and German railways across central Europe; eastward by the Trans-Siberian railway to the seacoast opposite Japan; southward through the Black Sea and Dardanelles to the Mediterranean; and northward through Archangel to the Arctic Sea. The roundabout rail connection with Scandinavian ports, involving transshipment of goods across a gap of several miles at the Russo-Swedish border, and the route, no longer available, up the Danube to the Nish-Saloniki railway and so out to the Mediterranean, are neither one sufficiently satisfactory to be reckoned among the principal trade routes of the Russian Empire, although both have served a useful purpose and the former is being rapidly improved. Since Russia is not a great manufacturing country and some of her most important munition factories have been destroyed by German spies, the supplies for her artillery must come largely from the outside world through one or more of the five routes just mentioned. But the German fleet and German mines close the Baltic outlet; Austro-German armies bar the way to the Austrian and German railways; the Turkish forts at the Dardanelles still control the exit from the Black Sea; and through the long winter of 1915 Arctic ice sealed the only port on the northern coast.[2]

There remained the single railway, many thousands of miles in length, connecting the hungry cannon of the Russian front with the munitions factories of Japan. When one considers how seriously is regarded the loss of a single railway from among the complex network of lines serving a short segment of the western battle front in France, one can perhaps appreciate the serious condition which confronted the Russian armies when a battle line nearly a thousand miles long became largely dependent on a single railway for its artillery supplies. This condition became known to the Teutonic commanders, who concentrated a large quantity of guns and munitions along the Dunajec-Biala front for a vigorous offensive. April 29 or 30 saw the opening of the campaign with a terrific artillery duel which lasted two days. Then the Russian field guns grew silent. Artillery supplies were exhausted and rifle ammunition greatly depleted. Troops which had easily held the Teutons at bay before the surrender of Przemysl released 250,000 of their comrades to help them in this task, now fell back in spite of the reinforcements because their guns had been starved all winter; because a single line of railway could not supply a thousand miles of battle front, especially after Japan's complications with China had reduced the shipments of Japanese munitions.

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[2] For an account of what Russia has done to overcome her isolation, see the article in this number entitled "Russia's War-Time Outlets to the Sea."

To what extent did the Teutonic offensive achieve its purposes? Warsaw was captured, Poland conquered, and a part of the railway system controlled. Bulgaria was influenced to join the Teutons, and the conquest of Servia thus made possible. A glance at the map (Fig. 1) shows that control of the great north-south railway system from Riga to Czernowitz was not secured, for the Russians still possess two great segments of the line. From Riga to Dvinsk the Dvina River and its marshes have proven an impassable barrier to the Teutonic forces; from Baranovitchi to the Galician border the Shchara, Pripet, and Styr Rivers, a connecting canal, and the Pinsk marshes stand between the exhausted Teutons and their objective. The much-coveted winter position was not secured by the Teutonic armies, and no satisfactory position is now available to them without an extensive withdrawal of parts of their line. Both Slav and Teuton lost heavily in men, but no part of the Russian army was surrounded and destroyed. The primary object of every war was not achieved by the offensive, and the Russian armies at the end of the great retreat, instead of being broken and demoralized, were able to take up defensive positions behind topographic barriers in an orderly manner and to beat back their pursuers along parts of the line with smashing blows. Assault after assault at the northern end of the line has profited the Germans nothing; while an advance of the Russians in Galicia has cost the Austrians heavily in killed and captured. No opportunity has been afforded the Teutons to detach large bodies of their troops from the eastern front for service in the west or against Italy. Russia, instead of being ready for peace, has been preparing a new offensive against the Teutonic line.

The attempts of the Teutonic armies to envelop and destroy some portion of the Russian forces involved the creation of several dangerous salients in the Russian line, followed by an endeavor to close the neck of each salient by attacks from both sides and so to isolate the armies forming its apex. The campaign in Galicia drove the Russian left wing eastward to the Bug and Zlota Lipa, thereby creating the great Warsaw salient. Incidental to this campaign was the creation of an important salient at Przemysl. After the Warsaw salient had been straightened out by the withdrawal of the Russian center to the line of the Bug, the salients of Grodno and Vilna were in turn developed. The great retreat ended with the unsuccessful German attacks against Riga and Dvinsk. The rôle of landforms in the Galician and Riga-Dvinsk campaigns, and their skilful utilization by the Russian commanders in extricating their armies from every salient, form the subject of the following pages.

The Galician Campaign and the Przemysl Salient. The attack on the Dunajec-Biala line, which began the Galician campaign the last of April, was directed against the whole of this front; but, according to report, with especial vigor against Cieżkowice, where the lines of trenches left the

Biala River to cross the hills toward the Carpathian crest (Fig. 2). Assuming the truth of the report, it is not difficult to understand why the locality mentioned should be a point of weakness in the Russian line. As described in an earlier article, both the Dunajec and Biala valleys are fairly open, flat-floored trenches with steep sides, which, with the streams meandering through them, form a natural moat of formidable proportions behind which the Russians had long maintained themselves in security. The function of these troops was to hold the Teutons at bay west of the moat, in order to protect those arteries of communication which extended from the main railway in the Tarnów-Jaroslaw lowland, up the northward-draining valleys to the Carpathian crest, through the Dukla, Lupków, and other passes, and so to the Russian front south of the main ridge. Failure of munition supplies rendering the defending troops impotent longer to perform their function, the first break in their line might well have been expected toward the south where the natural trench of the Biala is smaller and the line of artificial trenches left its protection for a more southeasterly course. It is not surprising, therefore, that the southern end of the Dumajec-Biala line was bent back with comparative rapidity, whereas the northern end, near Tarnów and beyond, did not abandon its defensive position until about a week later.

A branching river system in a mountainous district has one serious disadvantage as a means of supplying an army front located near its headwaters. The supply lines for many miles of front must follow the courses of the upper tributaries of the trunk stream, since communication across the intervening mountain ridges is impossible. An enemy may therefore cause the precipitate retreat of a long segment of the fighting line stretched across a series of converging tributaries by threatening to capture a few miles of the trunk valley. It was for this reason that the Russian front south of the Carpathians abandoned the hard-won mountain passes and fell back to the north and east, when the weakening of their comrades' hold on the Dunajec-Biala trench jeopardized the supply line in the Wislok and Wisłoka valleys.

The slow retreat of the northern end and the more rapid retreat of the southern end of the Russian line in west Galicia was significant in several respects. That part of the Russian line just north of the Vistula trench could retreat but slowly through the dissected upland of southern Poland, and would have been exposed to a flank attack from the south had their comrades back of the lower Dunajec been forced eastward so rapidly as to leave a gap between the two parts of the line. The defensive value of the broad Dunajec valley was doubtless important in insuring a retreat south of the Vistula at a rate which would permit maintenance of an unbroken front with the slow-moving troops to the north. On the other hand, the rapid retreat at the extreme south made impossible any simultaneous alignment of the entire west Galician army back of the Wisloka or Wislok trenches during the retirement. Toward the end of the first week in May the Russian line

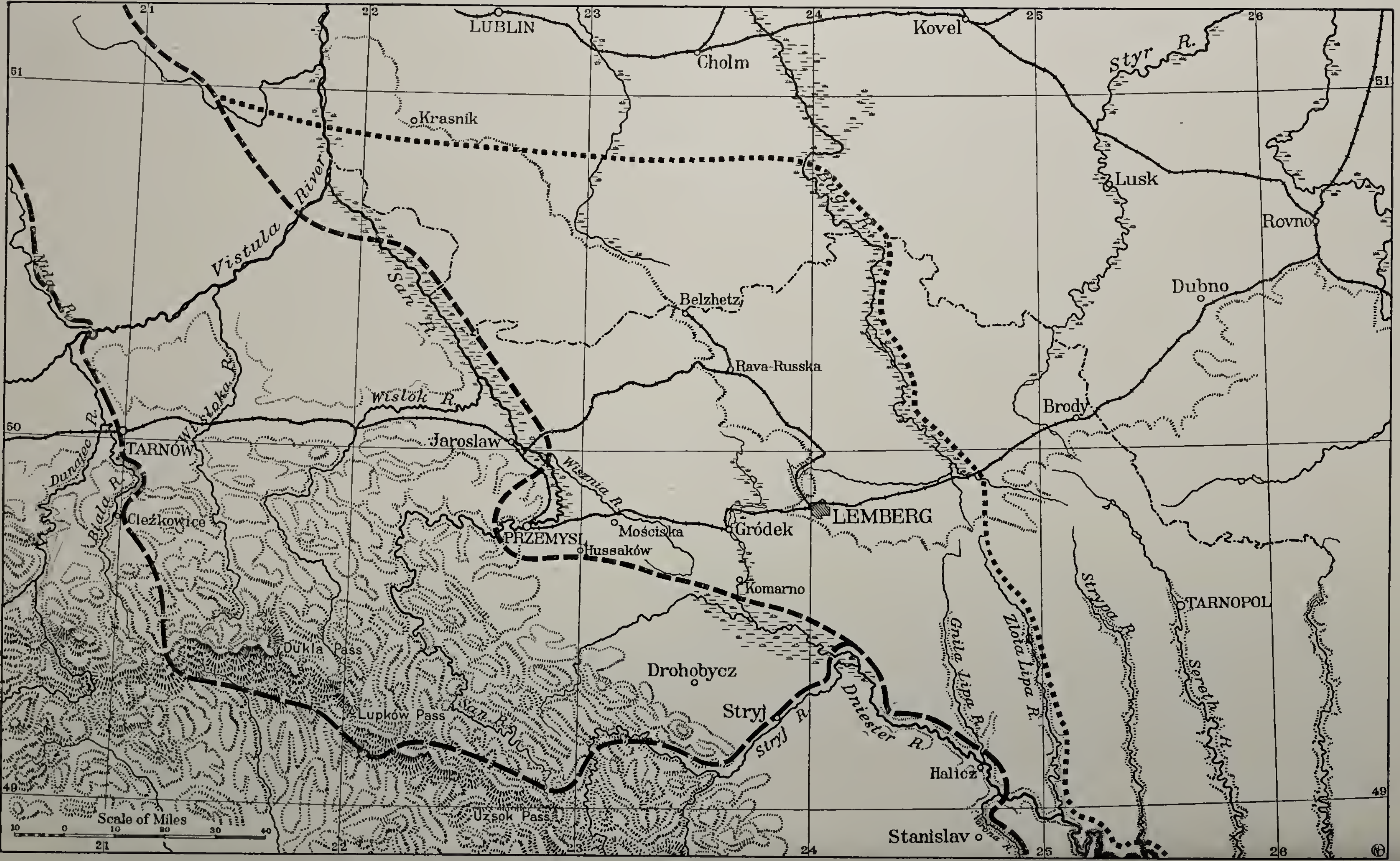

FIG. 2—Topographic features of the Galician region. Long dashes show the Russian position at the beginning

was behind the upper Wisloka trench toward the south but cut across country to the lower Dunajec farther north. A few days later it was back of the upper Wislok at the south, whence it cut across the hills to continue for some distance along the east side of the lower Wisloka. Not until the middle of May was the Russian line fairly well straightened out back of a continuous topographic barrier of the first importance, the San-Dniester belt of river and marsh. The character of this belt and its great importance as a defensive screen in earlier campaigns have been described in former articles. As will appear from the map (Fig. 2) there is a narrow isthmus of dry land between the San marshes and the marshes of the upper Dniester. Hussaków stands near the center of this strategically important land gateway, while a small stream, the Wisznia, does its best to close the gap and make the San-Dniester barrier complete. From behind this most formidable river barrier in Galicia the Russians administered the first serious check to the great Teutonic offensive.

At this time the Russian front departed from the line of the barrier in three places. Toward the north Russian troops were able to check the Teutons before retreating as far east as the San and Vistula and were subsequently successful in a temporary advance in that region. Far to the southeast the forces of the Czar had emerged from behind the deep trench of the lower Dniester and, pushing the Austrians before them, had advanced to the line of the Pruth (Fig. 1), where they established themselves behind the defensive screen of that river. The third peculiarity of the line was at Przemysl, where the line encircled the city to protect the removal of stores, munitions, and guns prior to its inevitable surrender to the enemy. This was the famous Przemysl salient, the first of four to be developed during the Russian retreat. It is the one in which topographical features seem to have played the least striking rôle.

The line defending Przemysl followed a curved course over the adjacent foothills of the Carpathians and doubtless profited by the partially reconstructed fortifications earlier captured from the Austrians. On the south it stretched across the dry-land bridge past Hussaków, protected by no topographic barrier of importance. To close the neck of this salient and capture the portion of the line thus isolated, together with the vast quantity of military stores and guns remaining in the city and its forts, the Teutons fought one of the hardest battles of the Galician campaign. As the attack from the north would be hindered by the position of the San marshes, we should expect the Teutonic armies to concentrate their most strenuous efforts in an attempt to push northward from the vantage ground of the more favorable topography about Hussaków. This is apparently what occurred. Beginning the middle of May, one smashing assault after another was delivered against the Russian line at Hussaków, and at Lutków a short distance east. Day after day, for a week or more, these assaults continued. The neck of the salient was only twelve miles wide, or but six miles from either side to the railway over which the Russians were ceaselessly shipping the contents of Przemysl to Lemberg and the east. Austrian and German guns dropped occasional shells on the railroad; but the work of evacuating the city continued with little interruption until all the stores, munitions, and big guns were safely removed. Then the Russians, leaving a small rearguard to cover the movement, withdrew their main forces to the line of the Wisznia, thus straightening out the Przemysl salient. The first decisive attempt to envelop and destroy a large segment of the Russian line had failed, probably because the barriers of river and marsh in front of other parts of the line could be held with sufficient ease to permit a large concentration of troops at the Hussaków gateway to meet and defeat the main Teutonic attack.

The Galician campaign could not proceed until the Russians were dislodged from behind the San-Dniester barrier. As was expected, the first blow for this purpose was delivered near Jaroslaw; for the Cracow-Jaroslaw lowland was the natural groove along which the Teutonic bolt could be fired with the greatest speed. It struck the San about May 14; lost momentum as it passed through river, marshes, and muddy slopes; and finally stuck fast on the opposite bank May 17. Meanwhile the operations against the Przemysl salient had begun. When the Russians surrendered the empty city about June 1 and withdrew to the Wisznia line, Mościska, near the center of the Wisznia barrier, bore the brunt of repeated assaults.

Unable to penetrate the natural defensive screen in this region, the Teutons sought for success farther south. The marshes of the upper Dniester made a general offensive against that part of the line out of the question, while the gorge of the lower Dniester had long proven an impassable barrier to the Austrians. The point selected for the next attack was therefore Zurawno, beyond the lower end of the great Dniester marshes, but above the beginning of the deep gorge. Although not on a railroad, Zurawno was chosen because its favorable physiographic situation more than compensated for the absence of direct railway communication. A violent assault carried the Teutons across the river June 6; but once more the difficulty of quickly transporting heavy guns and large supplies of bulky munitions across a river with deep channel, muddy floodplains, and slippery banks brought the forward movement to a speedy end; and a few days later the Austro-German forces were driven back to the south side of the valley.

Meanwhile the Cracow-Jaroslaw lowland had been pouring a steady stream of munitions into the Jaroslaw region. With these accumulated stores at their command, overwhelming superiority in artillery fire again favored the Teutons. Better means of crossing the San barrier must also have been constructed, since the troops which had reached the east bank during the first assault in May held a narrow strip of country there and so protected the engineers at work in the valley. A new offensive found he Russians unable longer to maintain their position in this section, and oward the end of June they retired to the Gródek line of lakes. At the same time an Austrian offensive along the Pruth drove the Russians back to their former position behind the Dniester gorge.

The Gródek barrier consists of a north-south string of lakes connected by broad belts of marsh through which rivers flow from one lake to another. Only an occasional narrow isthmus of dry land or an artificial embankment affords crossing to a railway or highway, as at Gródek and Komarno. Behind such a barrier a small body of troops could withstand the frontal attacks of vastly superior forces. But unfortunately the barrier is only 25 or 30 miles long; and while it connects with the Dniester barrier at the south, its northern end may be passed without difficulty. The Teuton armies ascending the gentle back slope of the Podolian cuesta did pass the northern end of the Gródek lakes, outflanking the Russians and forcing their further retirement. Meanwhile, although all efforts of the Austrians to cross the Dniester in force had failed, more and more of the western end of this secure position had to be abandoned as the eastward retirement of the Russians progressively uncovered the upper Dniester.

After the Russians withdrew from the Gródek line, those familiar with the topography of Galicia predicted that the next check to the Teutonic advance would occur when the north-south barrier of the marshy Bug with its braided channels was reached. The line of this stream may be regarded as prolonged to the Dniester by several of the parallel gorges descending the southern slope of the Podolian cuesta, of which the Gnila Lipa is one. Behind this trench the Russians took up their position the last of June. The Gnila Lipa trench is less easily defended, however, than that of the Zlota Lipa farther east. This latter stream rises so close to the source of the Bug as to form with it one practically continuous barrier and is characterized throughout by high and steep valley walls and in its middle course by a flat floor dotted with lakes and marshes. To this better position the Russians at the south soon withdrew, thus bringing their front into perfect alignment with their comrades farther north who had by now securely established themselves behind the marshy floodplain of the Bug (Fig. 2). Here the Teutons were held in check and the main Galician campaign ended; for the Warsaw salient was already strongly developed, and an attack upon it offered promise of greater returns than could an attempt to drive the Russians from behind so formidable a barrier as that of the Bug-ZlotaLipa-Dniester trench.

The Warsaw Salient. Leaving sufficient troops to hold the Russians behind the barrier just described, the Teutons turned their main forces abruptly northward to crush in the southern side of the Warsaw salient. About the same time an attack from the north drove the Russians back behind the Narew-Bobr line, and attacks against the west front caused a withdrawal to the protective screen of the Vistula. The supreme contest of the retreat was now fully joined, the prize consisting of Warsaw and central Poland; the apex of the railway system; the stores, munitions, and guns in the forts of Warsaw, Ivangorod, Novo Georgievsk and those of the Narew-Bobr line; and, most important of all, that great section of the Russian army defending the enormous salient. If the Teutons pushing northward from the Galician border and those pushing southward from the East Prussian border could quickly squeeze the neck of this salient narrow enough, all the prize would be theirs.

A map of the Warsaw salient (Fig. 3) makes clear the geographic elements involved. Nature had provided an admirable series of physical barriers for the defense of the salient, while man had constructed an excellent railway system back of and paralleling these natural defenses. The northern arc was protected by the Bobr and Narew Rivers with their almost impassable marshes, as well as by artificial fortifications erected at intervals along the streams. The strategic importance of this physical barrier and the repeated failure of German attempts to force it have been described in earlier articles. Back of this line and supplying its defenders is that portion of the Warsaw-Petrograd railway included between Warsaw and Grodno. Between Novo Georgievsk and Józefów the western arc of the salient is defended by what has often been called the most serious military obstacle in Europe,—the deep, broad trench of the Vistula with its steep walls, flat marshy floor, and swift river of majestic volume, unfordable and seldom bridged. Parallel to it and serving its defenders runs the Warsaw-Ivangorod railway. The southern arc, from the Vistula to the Bug, has as its protective screen a marshy forest through which the most practicable means of communication consist of two narrow causeways uniting the nearest rail ends at the Galician border with Lublin and Cholm. Parallel to this front is the railway running eastward from Ivangorod through the two towns just mentioned. All of the peripheral railways are further supplied by branches radiating from the central part of the salient.

The problem of the Germans on the north was to break through the Narew-Bobr screen and push southeast across the Warsaw-Petrograd railway toward Brest-Litovsk, while their comrades on the south advanced through the marshy forest and across the Lublin-Cholm railway toward the same point. If the two wings could advance even at moderate speed, the lines of Russian retreat would be cut and the trap would close before stores, munitions, guns, and men could possibly be withdrawn to the east. Meantime the army west of the Vistula was to play the subordinate rôle of holding the Russians engaged behind that barrier until the weakening of their line by withdrawal of men should render the crossing of the stream feasible. The Russian problem was so to utilize the natural defenses as to prevent a Teutonic advance; or, failing this, to render the advance so slow that ample time would be available for the complete

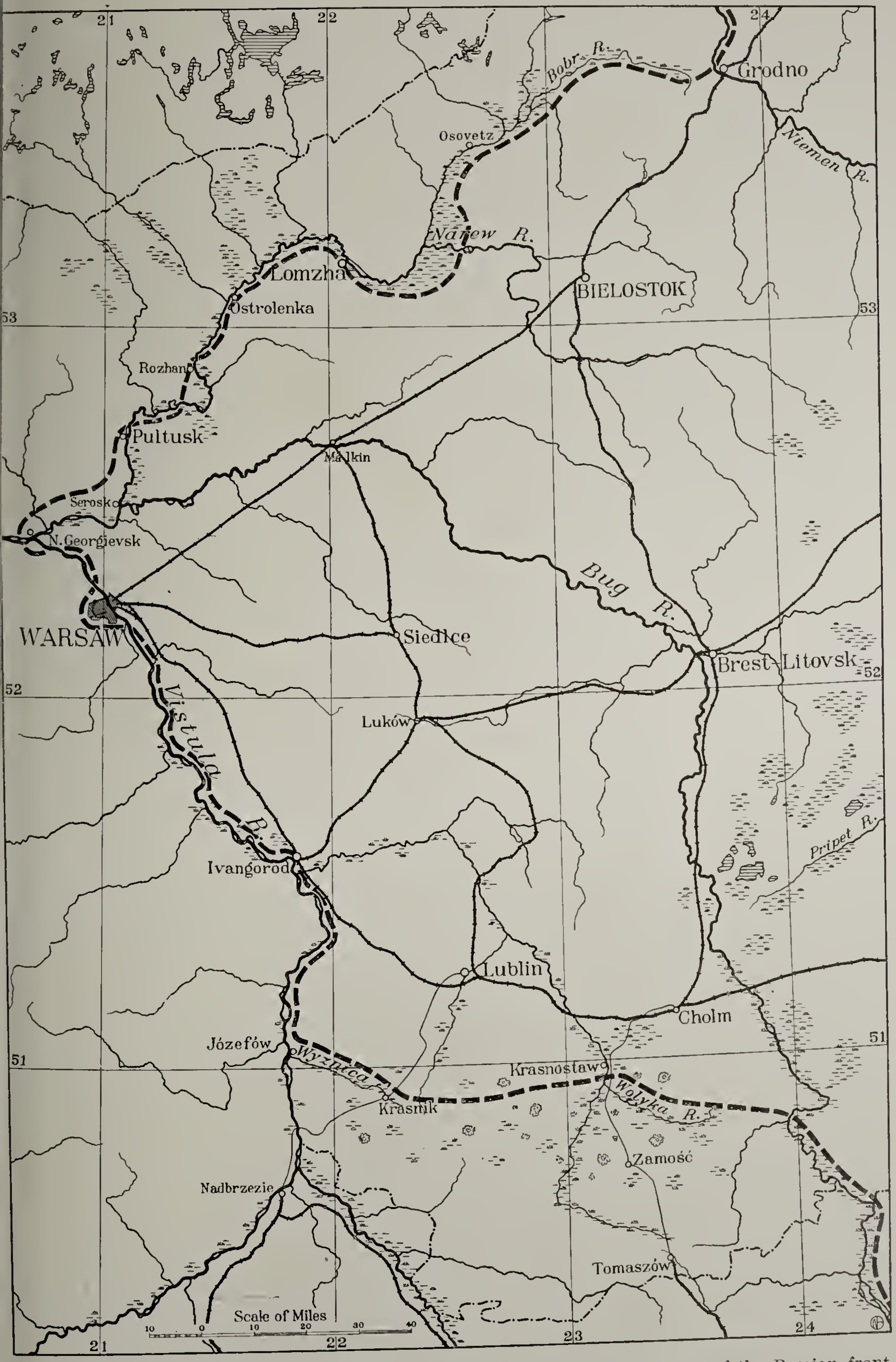

FIG. 3—The Warsaw salient. The broken line shows approximate position of the Russian front. Scale, 1:2,300,000.

evacuation of Warsaw, Ivangorod, and other fortified places, and the wit drawal of the main body of troops before the railways to the east shou be cut.

The advance on Lublin and Cholm was undertaken by an Austria army moving along the Krasnik causeway and a German army movin along the Zamość causeway, both armies being supplied from the rai way termini near the Galician border. (The causeways are indicated b hair-lines on Figure 3.) At Krasnik the Austrians encountered the Russia lined up back of the marshy valley of the Wyznica River. Frontal attac against this barrier seem to have been unsuccessful; but it appears th farther east the Austrians were able to advance around the head of th river where the ground was dryer and so to flank the Russians out of thei defensive position. Progress was extremely slow, however, the defense o the narrow causeway in a marshy forest being overcome only with th greatest difficulty.

Similar difficulties were encountered by the German army when the found their advance along the Zamość causeway contested by Russia forces entrenched behind the marshy barrier of the Wolyka River, jus south of the town of Krasnostaw. A fierce battle was fought before th Germans were able to dislodge the enemy from his position of advanta and capture the town. The average rate of advance along the causewa for both Austrian and German forces was less than a mile a day. At thi rate the southern jaw of the trap would never close in time to catch th Russian bear. The supply of artillery and munitions from distant base by means of the two congested causeways traversing difficult country wa far too slow to render the southern armies capable of striking quick effective blows. It became evident that dependence for Teutonic succes must be placed in the northern armies under von Hindenburg. Althoug the southern armies were within ten miles of Lublin and Cholm on Jul 18, it was not until the end of the month that they reached the railwa and cut one line of Russian retreat.

For the purpose of smashing through the Narew-Bobr line von Hindenburg, who knew from painful experience the difficulty of the task, had at his disposal an enormous army, fully equipped and plentifully supplied with accumulated stores of ammunition. The attack began about the middle of July. In the course of a week or ten days small bodies of German troops succeeded in breaking through the barrier at isolated points but were unable to press these slight gains. Two weeks more of hard fighting failed to secure an average gain of half a mile a day at any point. About August 1 the Russians began the evacuation of Warsaw and Ivangorod in an orderly manner. The forts were dismantled, the stores and big guns shipped east by rail, and everything of military value removed or destroyed. Meanwhile the Teutons had succeeded in crossing the Vistula in force above Ivangorod. With a thin screen of rearguard troops holding the defensive lines, the bulk of the Russian army was now transferred eastward to its new position. One of the most brilliant retreats in military history was thus accomplished, because the physiographic character of the Narew-Bobr line enabled the Russian rearguard to hold at bay vastly superior forces under the redoubtable von Hindenburg and so retard their movements that more than a month of furious fighting netted them an advance of less than twenty miles. It was near the middle of August when the Russian rearguard began to retire, and the Teutonic forces were allowed to close the empty trap.

Novo Georgievsk forms an exception to the rule that the Russians removed men, guns, and munitions from their forts before retiring; for here the forts remained intact and a considerable body of troops was left to garrison them. Since there was ample time to evacuate these forts as perfectly as were those at Warsaw and Ivangorod, it may be wondered why guns and men were left to the certain fate of ultimate capture. The explanation of the mystery is geographical. In an earlier article I emphasized the fact that while the Vistula was a formidable barrier to an attacking enemy, it was an admirable supply line for the forces which controlled it. As soon as the Warsaw salient should be evacuated this supply line would become available to the Teutonic forces following the retreating enemy, and boats pushing southward up the river to deliver stores and munitions all along the rear of the eastward moving armies would enormously facilitate a vigorous offensive. This could be prevented, however, so long as the guns of Novo Georgievsk kept the barges of ammunition and other supplies assembled in the lower Vistula from ascending the stream. Hence the sacrifice of men and guns to delay for two weeks the Teutonic use of the middle Vistula.

The Grodno Salient. In the continued eastward retreat of the Russians following their escape from the Warsaw salient, there was developed, early in September, an important salient with the fortress of Grodno at the apex. Reference to a map (Fig. 8) showing the approximate position of the Russian forces at this time will make clear the striking resemblance between the smaller salient and its greater prototype about Warsaw. Let Grodno stand for Warsaw, the Niemen-Meretchanka barrier for that of the Narew-Bobr, the Niemen from Grodno to Mosty for the Vistula, the Rossa River for the north-south segments of the upper Bug, and the strategic relations will be apparent without detailed discussion of them. Even the railway lines occupy strikingly similar positions within the salient; and the most important difference in the two cases is that the south side of the Grodno salient is not prolonged as far eastward as in the Warsaw case, the Russian line turning south along the Rossa instead of continuing eastward to follow the Shchara, which would have made a better equivalent of the Bug.

The task which confronted the Teutons was to cross the barrier of the

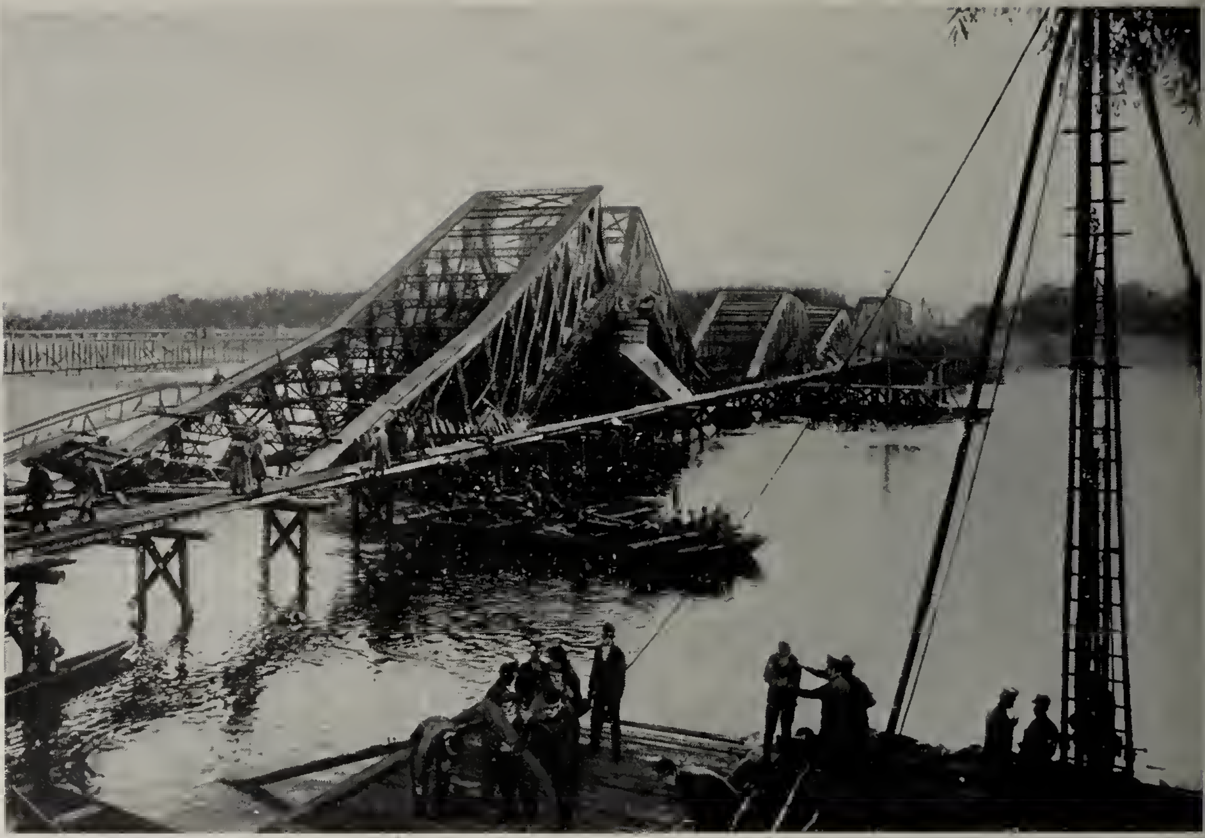

FIG. 4.

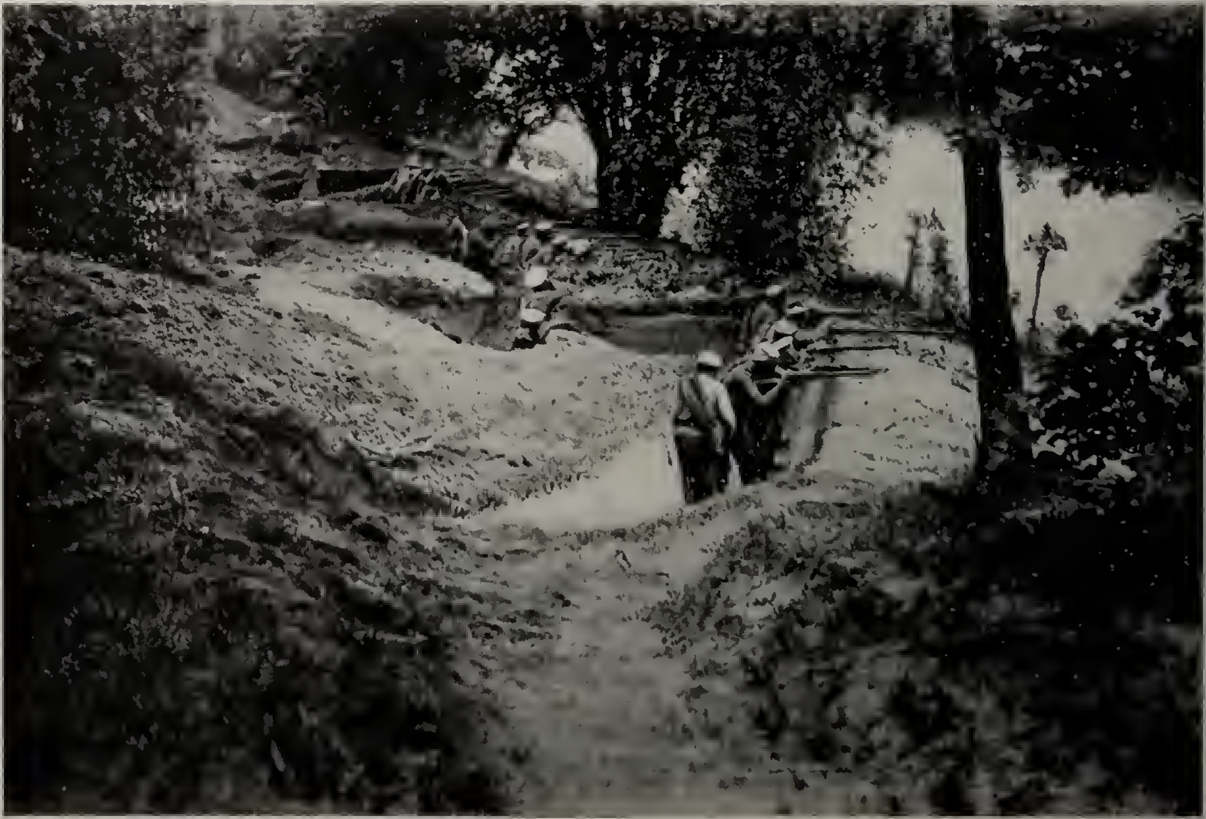

FIG. 5.

FIG. 4—Bridge over the Vistula at Warsaw, destroyed by the Russians before their retreat. The view shows Austrian and German engineers restoring communication across the broad barrier formed by the great river. (Photo copyright by Underwood & Underwood.)

FIG 5—Russian trenches along sloping east wall of the broad and deep natural trench cut by the Niemen River. The Russian soldiers are in the act of repelling a German attempt to cross the barrier. (Photo copyright by Underwood & Underwood.)

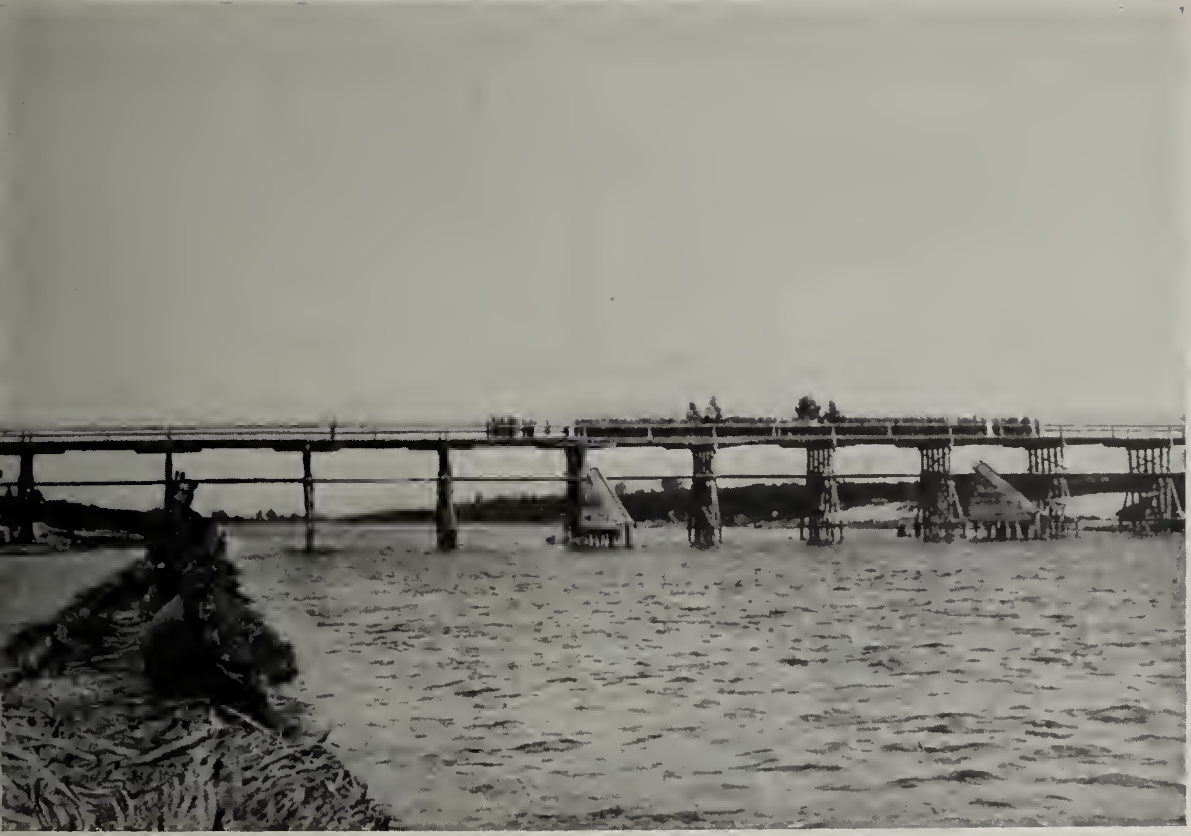

FIG. 6.

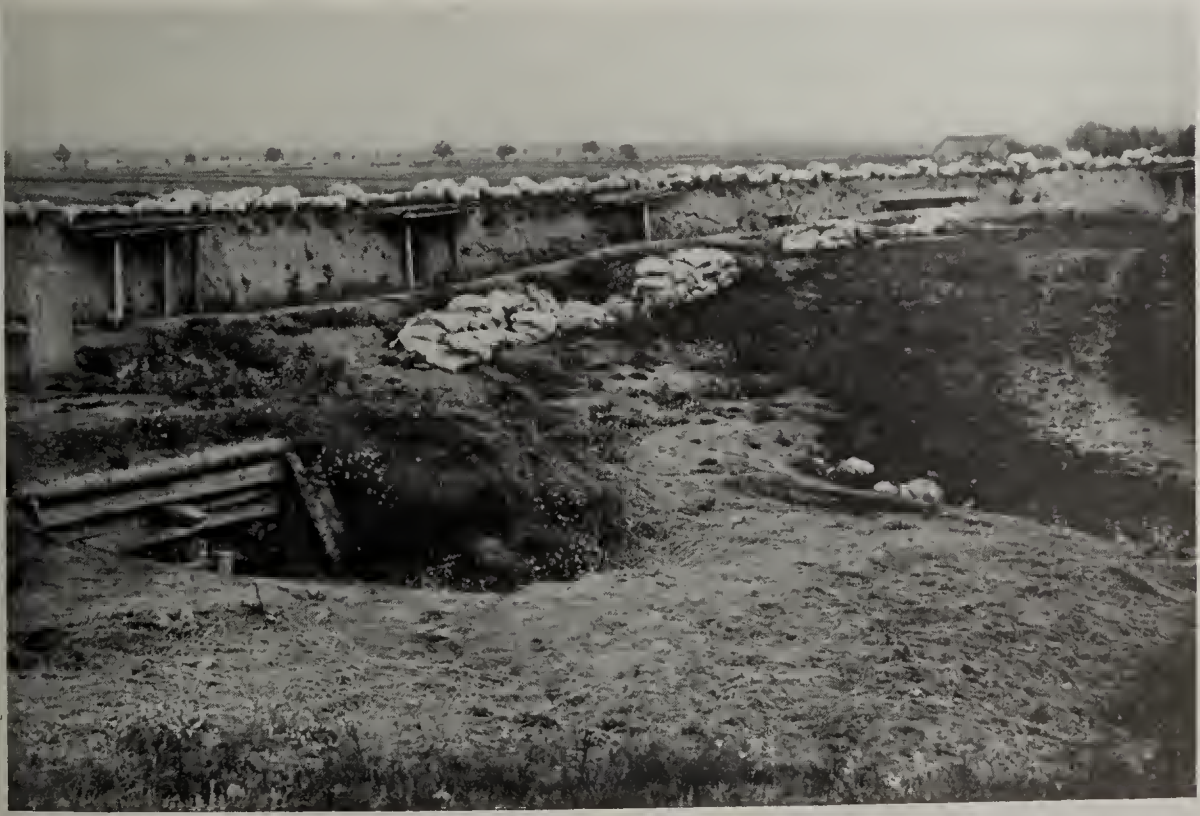

FIG. 7.

FIG. 6—Temporary bridge built to establish communications across the barrier of the San River. (Photo copyright by Underwood & Underwood.)

FIG. 7—Part of the Russian fortifications at Rozhan reinforcing the natural barrier formed by the broad, marshy floor of the Narew valley, visible in the distance. (Photo copyright by Underwood & Underwood.)

Niemen north of Grodno or, better still, the Meretchanka, which was neare their objective, and cut the Warsaw-Petrograd railway; and at the sam time to cross the Niemen between Grodno and Mosty in order to cut th only other line by which the forces about Grodno could retreat. Fo their part the Russians must hold the Teutons on the farther side of th river barriers until Grodno was evacuated and the troops at the apex o the salient could escape. As in the Warsaw case, the principal Teutoni attack seems to have been directed from the northwest; but unlike the larger example, it would appear that Grodno fell as the result of direct assault about the first of September. To crush in the apex of a salient is, however, to achieve a comparatively small result. The railways back of the barriers must be reached and cut if the retiring army is to be destroyed. A week after the fall of Grodno the Germans were still battling vainly to cross the Meretchanka on the north and the Rossa and Niemen on the south. Aided by topographic obstacles the Russians were able to make good their escape. When the Grodno trap closed it, too, was empty.

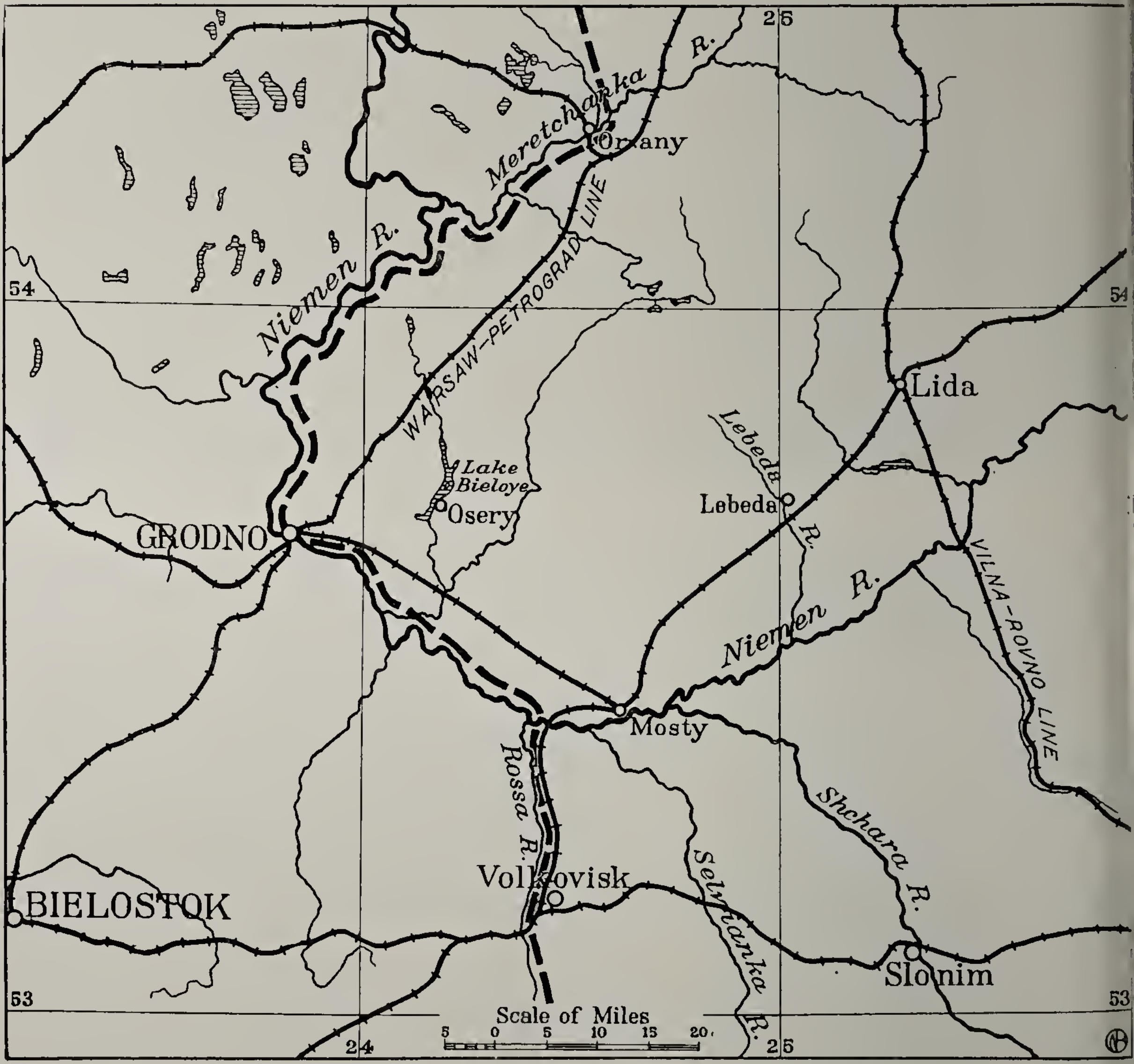

FIG. 8—Approximate position of the Russian front (broken line) at the Grodno salient. Scale, 1:1,500,000.

A few days later the Russians behind the Rossa fell back to the east bank of the Selvianka, where the Teutons advancing along the Bielostok-Slonim railway were held at bay for some time and compelled to fight a hard battle for the rail-crossing over the river. A further retirement to the line of the Shehara was then effected, the troops of the salient having meanwhile retired to the Lebeda line.

The Vilna Salient. Before the fate of the Grodno salient had been fully settled, or about the beginning of the second week in September, the development of the Vilna salient began. Retreat from Vilna could be effected by three railways: northeastward toward Dvinsk by the Warsaw-Petrograd line, here defended first by the Viliya River and later by the much smaller Shemyana, which runs parallel to and west of the railway for 35 miles; southeastward by the Vilna-Minsk line, protected on the north by the Viliya River and a series of lakes and marshes; and southward through Lida by the great north-south Vilna-Rovno line described in the early part of the present paper, which, in this region, is protected by several small streams and marshes between Vilna and Lida and farther south by the Lebeda and Shehara.

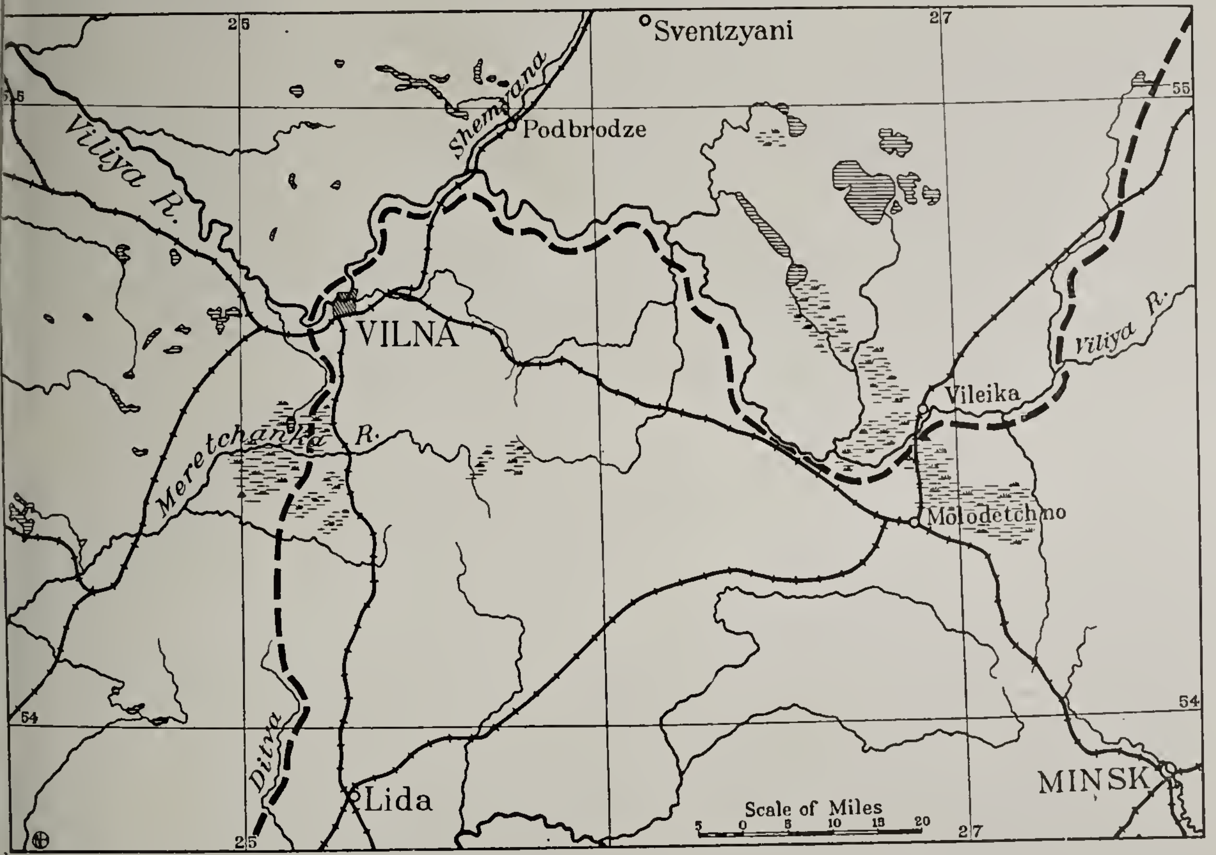

FIG. 9—Position of the Russian front (broken line) when the Vilna salient was most strongly developed. Scale, 1:1,850,000.

When the Russian line, pressed by the pursuing Teutons, took up its position along the Viliya and Shemyana Rivers, a very slight salient was created with Vilna as the apex. Heavy assaults intended to break through the barrier and cut the railway immediately behind it achieved success about September 12, when German troops crossed the Shemyana nea Sventzyani and severed communications between Vilna and Dvinsk. It i worthy of note that the assaults were successful where the smaller rive formed the railway's only protection. The Russian troops now fell bac to the south behind the more formidable barrier of the Viliya in order t protect the Vilna-Minsk line; and for days the despatches recorded th furious attempts of the Teutons to secure "the fords of the Viliya." German cavalry moving rapidly southeast reached Vileika September 17 The Vilna salient was now developed in its most acute form, the positio of the Russian front at this time being roughly as represented in Figure 9

About the same time that Vileika was captured the Germans forced passage at the fords of the Viliya north of Vilna, thus breaking throug near the apex of the salient, and likewise forced a passage of the Shchar south of Slonim (Fig. 8), thereby rendering retreat southward by th Vilna-Rovno line dangerous. There remained another avenue of escape the Vilna-Minsk railway; but this was temporarily closed about Septembe 18 when by a rapid dash over the Viliya German forces reached the vicinity of Molodetchno junction and seriously threatened the main line at that point. The same day German troops entered Vilna.

A great body of Russian troops was now caught in the Vilna salient, and every avenue of escape seemed in German control. Berlin rejoiced a the first success of the Teuton armies in closing one of the famous salients with a large prize inside. But the joy was premature. Truly the trap had closed; but its jaws were too weak for the size of the bear it had caught. The inadequate German forces at Molodetchno were hurled back across the Viliya, the defensive line re-established, the railway opened, and the Russian armies and their equipment safely removed to a new front farther east.

The Riga-Dvinsk Campaign. While the operations about Grodno and Vilna were still in progress, the extreme left of the Teutonic line was attacking the region of the lower Dvina River. About August 1 the important railway center of Mitau was taken by the Germans, and the campaign for the possession of Riga and Dvinsk begun. Before long the ablest German generals and their best seasoned troops were here engaged in some of the most furious fighting of the war. For more than five months first Riga and then Dvinsk have been subjected alternately to desperate assaults which have cost the Germans an unbelievable toll in killed and wounded and have gained them nothing. A naval battle for control of the Gulf of Riga formed part of the operations directed against the two cities, which have appeared more prominently than any others in the war despatches ever since last summer.

The accompanying map (Fig. 12) gives the geographic answer to the question, "Why have the numerous German offensives against Riga and Dvinsk failed?" Between these two cities runs the northern segment of

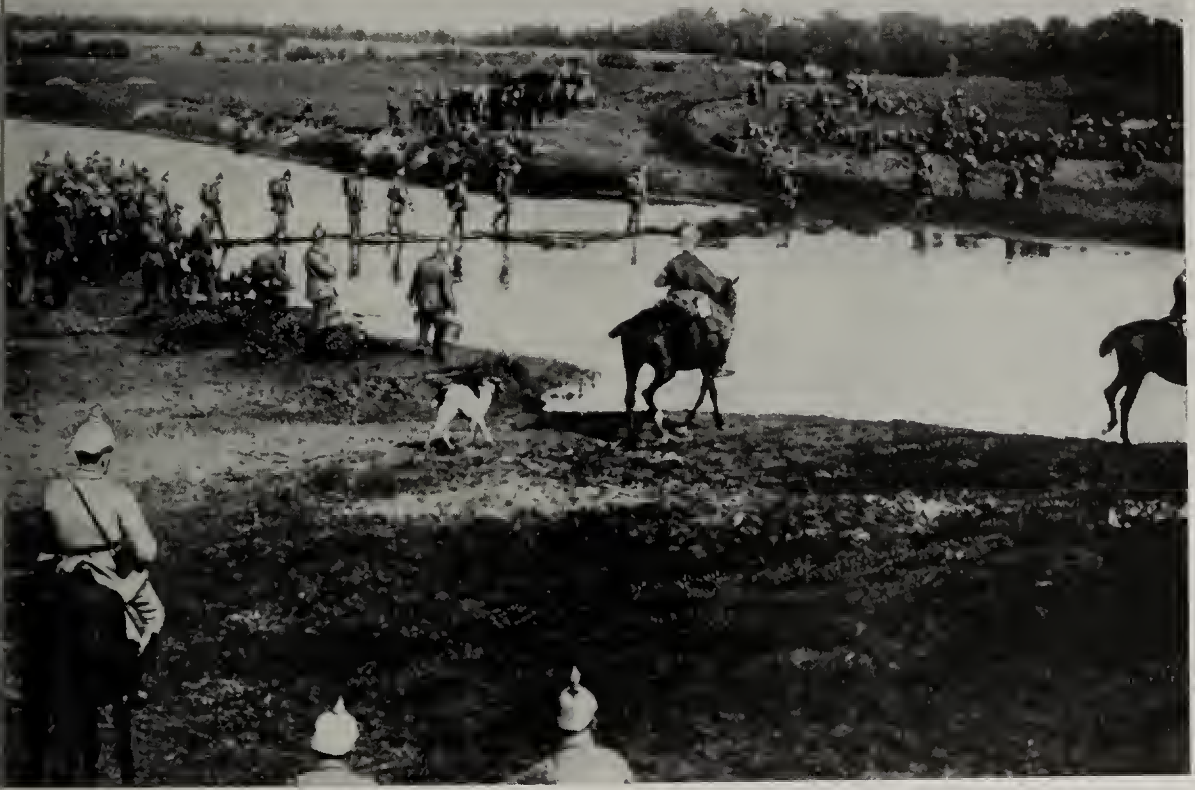

FIG. 10.

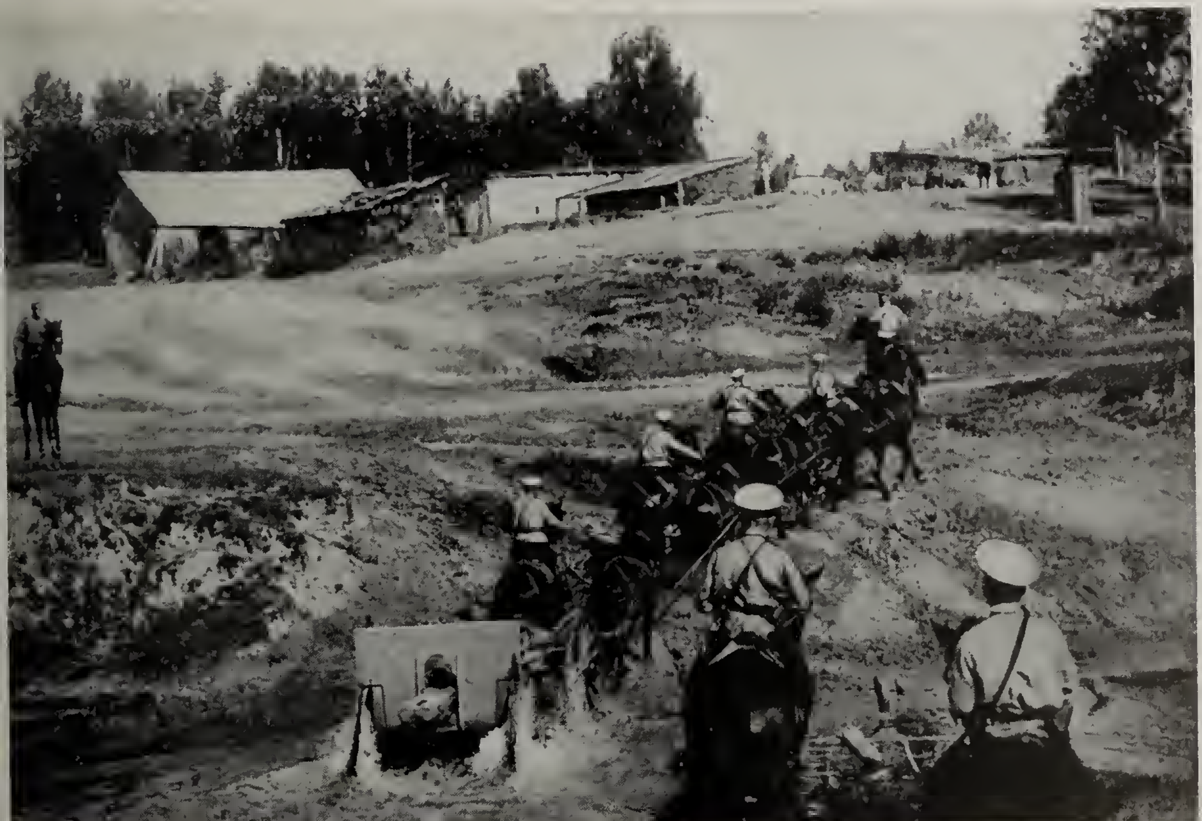

FIG. 11.

FIG. 10—German troops crossing the Selvianka River in single file on a temporary bridge of logs. The difficulty of forcing even so small an obstacle as this narrow stream, under enemy fire, is obvious. (Photo copyright by Underwood & Underwood.)

FIG. 11—Fording a river with field artillery. Many horses are required for each gun, and all guns must be protected from moisture by waterproof coverings. A small stream may thus seriously delay an advancing army. (Photo copyright by Underwood & Underwood.)

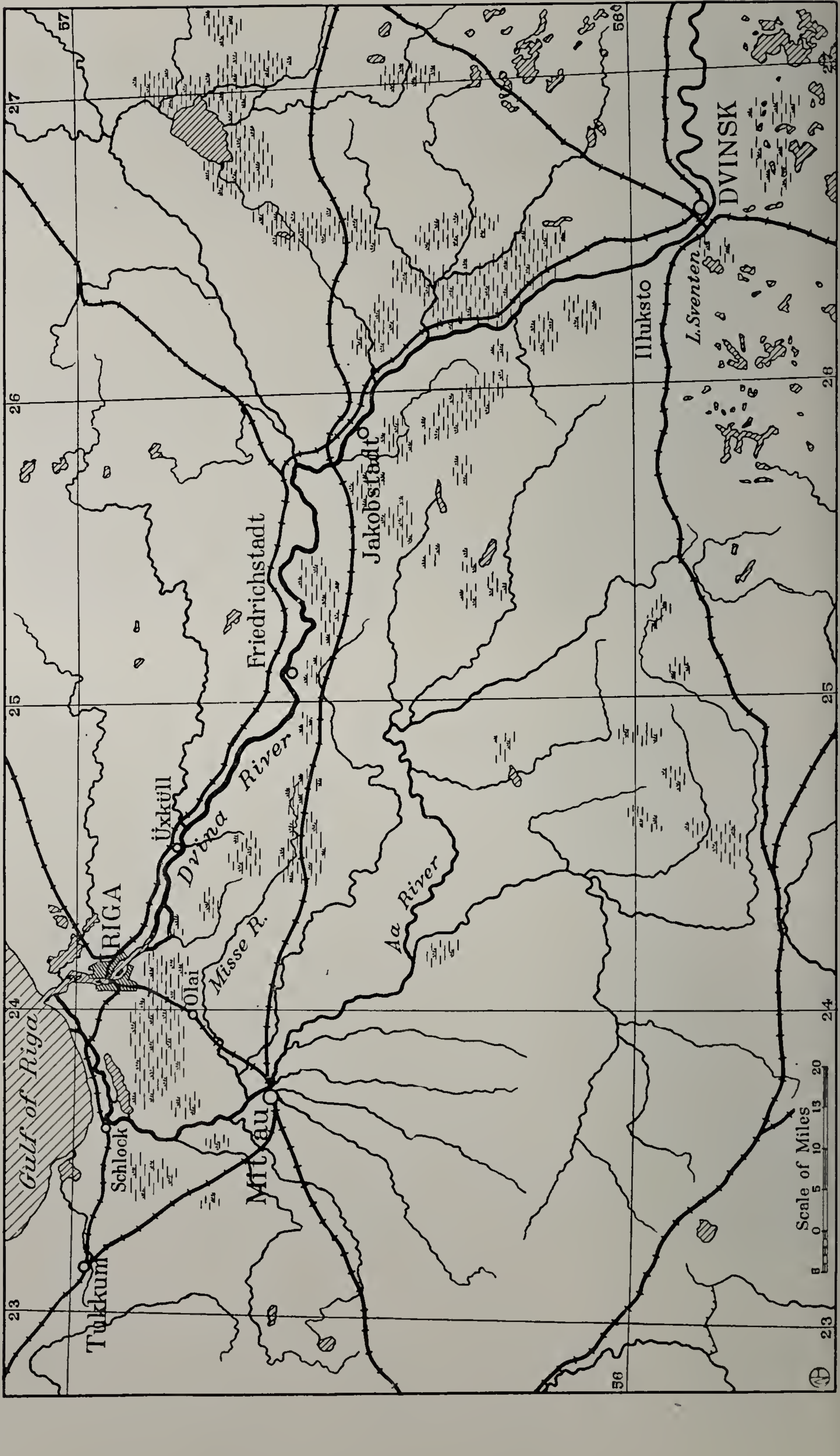

FIG. 12—Natural barriers of the Riga-Dvinsk region. Scale, 1:1,500,000.

the north-south railway system previously described as essential to the Germans if they were to establish themselves on a satisfactory winter line in the east. Parallel to the railway, and protecting it on the southwest, is the broad, deep current of the Dvina River. Southwest of the river is a belt of marsh which adds materially to the defensive strength of the natural barrier. With but few exceptions the marshland is devoid of roads and practically impassable for troops,—wholly so for heavy artillery. At its northwestern end this topographic barrier is protected from a flank attack by the Gulf of Riga and the lower course of the Aa River; at the southeast similar protection is afforded by the belt of lakes and marshes south of Dvinsk, forming the continuation of the morainic belt of East Prussia, and by the east-west course of the Dvina River. Seldom has a strategic railway been more securely situated behind natural fortifications.

We may divide the campaign for the Riga-Dvinsk line into three parts: first and most important of all, the operations against Riga with the object of turning the right of the Russian defensive line; second, the attempts to break the line at Friedrichstadt and elsewhere by frontal attacks; and third, the efforts to capture Dvinsk and thus turn the left of the forces behind the river. The assaults against Riga began with an advance from Mitau along the Mitau-Riga railway, early in August. About halfway between these two points is the small town of Olai, important to us because it marks the place where repeated German attacks have ended in failure. Immediately north of Olai is the great Tirul marsh; just south is the Misse River flowing through a marshy forest. One German assault after another has failed to penetrate one or both of these topographical barriers, and the name Olai has thus come to be associated with costly Teutonic defeats with which the town and its artificial defenses had little or nothing to do. German successes in the east have usually been achieved through the effective use of very heavy artillery in battering down the resistance of the lighter Russian guns. Wherever marshes have restricted the use of heavy artillery to the narrow front offered by a railway embankment or causeway through the wet country, Teuton and Slav have met on more equal terms, and the Teuton offensive has languished.

After several weeks of costly but unsuccessful assaults against the marshy barrier from the south, the Germans shifted their forces to the west and attacked from the direction of Tukkum. In reports of this fighting the town of Schlock has figured prominently, for reasons readily apparent from the map. The lower Aa River makes an effective north-south barrier which has its northern end at Schlock. Here the river turns east and flows parallel to the gulf coast for many miles, as if deflected from its normal course by a broad sandbar deposited under the influence of an eastward moving current in the gulf. South of the deflected river and increasing its value as a barrier is a long narrow lake known as Lake

Babit. The Tukkum-Riga railway follows the bar between river and gulf for some miles before crossing the river on its way to Riga. It appears, therefore, that the north-south segment of the Aa River, reinforced on the east by the Tirul marsh, interposes an impassable barrier to any advance south of Schlock; while the logical route along the railway would compel the attacking forces to advance in column on a narrow ridge of land flanked on both sides by bodies of water from which or across which Russian guns could direct a deadly flanking fire. Topographic conditions would seem to render impossible any hope of a successful attack against Riga from the west; yet the Germans struggled fiercely to capture the city from this direction. The name of Schlock is naturally associated with their failure to penetrate the physical barriers near that town. The naval engagement for control of the Gulf of Riga seems to have ended in favor of the Russians and thus to have assured to their right flank the protection of the sea.

In attempting to break through the Dvina river and marsh barrier the Germans succeeded in capturing Friedrichstadt near the center of the line early in September and may even have thrown some troops over the river to the north bank. This degree of success was favored by the parallel railway close to the river on the south, from which one of the few roads through the marsh connects with the town. But the consummation of the success thus begun was rendered impossible because of the obstacles presented by both river and marsh to an advance with front sufficiently broad to make the crossing of the river effective; and because the country north of the river is a marshy forest, largely devoid of roads, through which the troops which may have crossed could make but little progress. The railway last mentioned bridges the Dvina near Jakobstadt, and the Germans were thus aided in an attack near that town which brought them close to the river, but apparently not to its northern bank. Near Üxküll several islands in the river afford opportunity for a crossing which would further be aided by the fact that small streams from the south provide facilities for constructing pontoons in safety behind the German lines and floating them down into the main river in the shelter of the islands. A heavy bombardment of Üxküll led the Russians to anticipate a crossing here, but apparently it was never effected, the unfavorable topographic elements more than counterbalancing those favorable to such an operation.

The campaign against Dvinsk has failed because of the inability of the Germans to get past the lakes, marshes, and streams guarding the southeastern end of the Riga-Dvinsk barrier. Dvinsk is protected in the first instance by a great bend in the Dvina River which forms a natural moat on all sides but the north. Beyond the river to the west and south lie the marshes and lakes often mentioned in the despatches. Lake Sventen to the west, with its associated marshy forest, has in particular proven a formidable obstacle to many attacks; while the marsh to the southeast checked a flank attack from that quarter. The losses suffered by the Germans in their frequent attempts to storm the passes between the lakes have been most serious. Indeed, the terrific but fruitless assaults against the natural fortifications of the whole Riga-Dvinsk region, covering a period of more than five months, have created appalling casualty lists and materially weakened the chances of the Germans to conduct successful offensive movements in the future. A similar weakening for a similar cause has been apparent at the southern end of the eastern front, where the Austrians and Germans who had recently pushed their offensive to the Goryn and Sereth Rivers were later thrown back to the line of the Styr and Strypa, with heavy losses in prisoners as well as in killed and wounded. On the other hand the Russian armies, protected by the troops lined up back of the Dvina-Pripet-Styr-Strypa barrier, have secured an opportunity to reform their shattered forces, equip another group from their almost limitless supply of fighting men, and so confront their enemies in a few months, as strong or stronger than they were in April, 1915, when the great retreat began.

PROTECTION FROM DAMAGE BY FROST

By **WILLIAM GARDNER REED**
University of California

Introduction[1]. Although the great physical processes controlling the weather are not subject to modification by man, meteorology is pointing out ways in which some of the results of weather conditions may be avoided. A notable instance of the economic importance of meteorological study is to be found in the diminution of frost damage, which was formerly regarded as an unavoidable misfortune to be borne at more or less frequent intervals, even though greenhouses and a paper covering for small gardens had long been known. These small-scale experiments, however, had little influence on the solution of the great economic problem of protecting commercial crops from frost damage until climatologists began to study the related physical principles.

Investigations of frost damage and the weather conditions which give rise to frost have shown that its occurrence can generally be forecast and that the prevention of damage is possible. Even where complete protection fails, the damage is greatly lessened. Frost damage is in many cases the result of neglect.

Conditions of Frost Occurrence. There are three classes of damaging low temperatures: (1) hoar frost, in which the temperature of the air near the surface of the earth is below the dew point and the dew point is below 273°A (32°F); (2) "black frost," or "dry freeze," in which the temperature of the air near the surface of the earth falls below 273°A under local radiation and the dew point is not reached; and (3) "general freeze," when the air is thoroughly mixed and the whole mass is below 273°A.[2] With hoar frost and dry freeze inversions of temperature are the rule; this is not the case with the general freeze. As the general freeze occurs at times when plant activity is suspended, that is during the winter, it is of little economic importance. The amount of air involved makes protective measures impracticable and the condition is not properly a part of the frost problem.

Both hoar frost and dry freezes are the result of strong local cooling under a clear sky; the earth, losing heat rapidly to space, becomes very cold and the air lying on it is chilled. The cold air remains in the lower places so that frost damage is apt to be intensified in the valleys.[3] The low temperatures are a result of local cooling, but the general meteorological conditions control the possibility of such cooling. The controls vary in different parts of the country, but frost conditions are associated with anticyclones; the air then has a low relative humidity and the sky is clear. Hoar or black frost cannot occur with even a moderate wind, as wind tends to mix the air, thus preventing the intense cooling near the earth.

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[1] A selected bibliography on frost in the United States by Cora L. Feldkamp and the writer is published in the *Monthly Weather Rev.*, Vol. 43, 1915, pp. 512-517. This bibliography is intended to cover the subject adequately, but in general earlier titles have not been repeated where later papers cover substantially the same ground.—On the same topic as this paper, see also the item on p. 146.

[2] A. E. Beals: Forecasting Frost in the North Pacific States, *U. S. Weather Bur. Bull. 41*, p. 41, Washington, 1912.

Frost Damage. Frost damage is the result of low temperature only; the appearance of crystals is merely an indicator of the temperature. ''Low temperature congeals the watery part of the cell sap and also the intercellular water content of the plant. Within certain limits this may or may not be injurious, provided the protoplasmic contents of the cell are able to absorb the water and do this before the cell structure collapses as a result of insufficient cell turgor. Frequently the frosting of plants is followed by a sudden rising of temperature, in which case the water which was part of the cell sap in the normal condition of the plant escapes through the cell wall into intercellular spaces, or even from the plant entirely, and thus the protoplasm of the cell, being unable to assume its normal condition, becomes disorganized and decomposition follows.''[4] Frost damage may be prevented by keeping the temperature above the freezing point of the plant juice, and also in many cases by preventing rapid warming after freezing. The heat released by the condensation of moisture tends to make hoar frost less dangerous than low temperatures in which condensation does not occur, because condensation checks further cooling.[5]

Methods of Protection. Methods of protection against frost damage may be classified according to the physical principles involved, although most of the commercial methods are based on combinations of these principles. It should be noted that the cost of protection is a very important factor in the commercial application of protection. It is not practicable to protect at a cost greater than the value of the crop, unless this is necessary to save trees. The cost of protection is properly insurance, and the profits must be sufficient to carry this cost if protection is to be commercially possible. In general, only crops demanding very intensive methods of cultivation, such as fruit and vegetables, are able to bear this charge.

Protection from frost damage is based on the prevention of freezing temperatures or on the protection of frosted plants from too rapid warming. The preventive measures are safer, as the protection of the frosted plants is essentially an attempt to help the plant recover from

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[3] C. F. Marvin: Air Drainage Explained, *Monthly Weather Rev.*, Vol. 42, 1914, pp. 583-585; A. G. McAdie: Temperature Inversions in Relation to Frosts, *Annals Harvard College Observ.*, Vol. 73, pp. 168-177, Cambridge, 1915.

[4] E. R. Lake: Action in Plant Life When Subjected to Frost, *U. S. Weather Bur. Climate and Crop Service, Oregon Section*, Vol. 6, No. 7, p. 3, Portland, 1900.

[5] See "Latent heat" in any good text on physics.

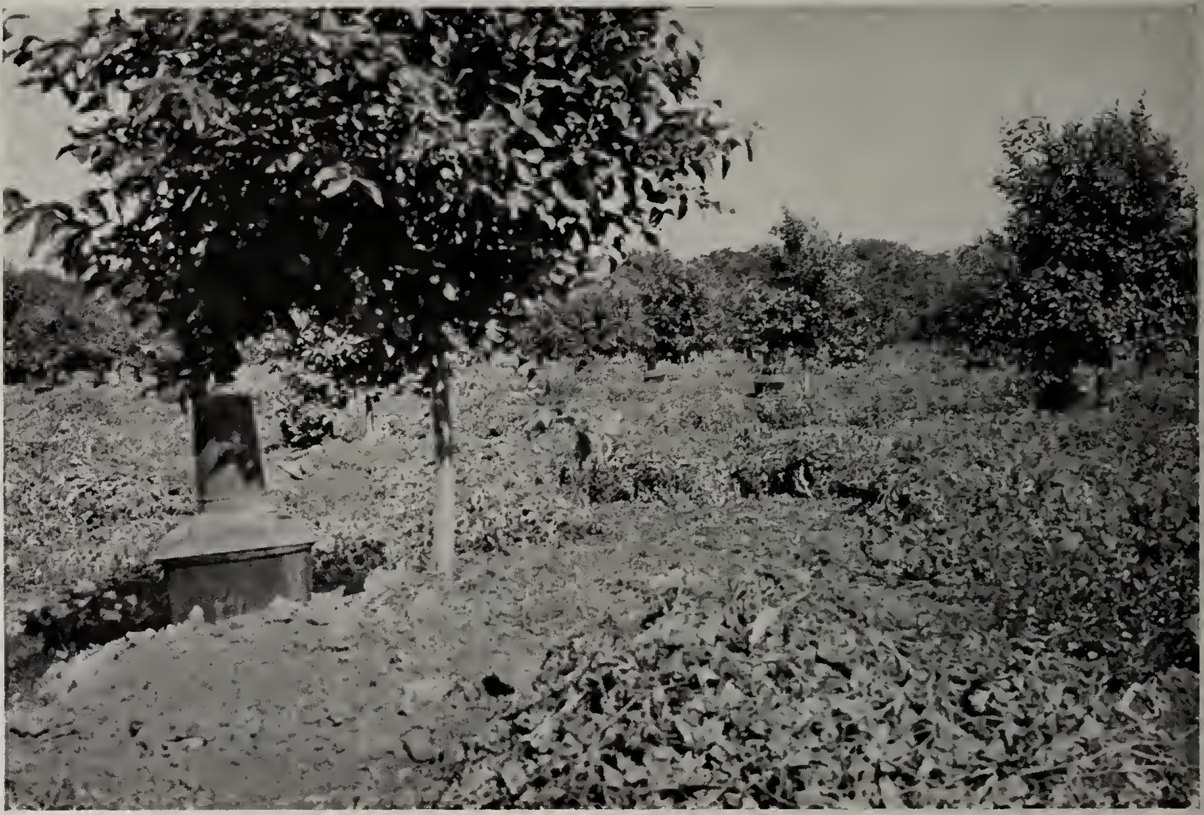

FIG. 1.

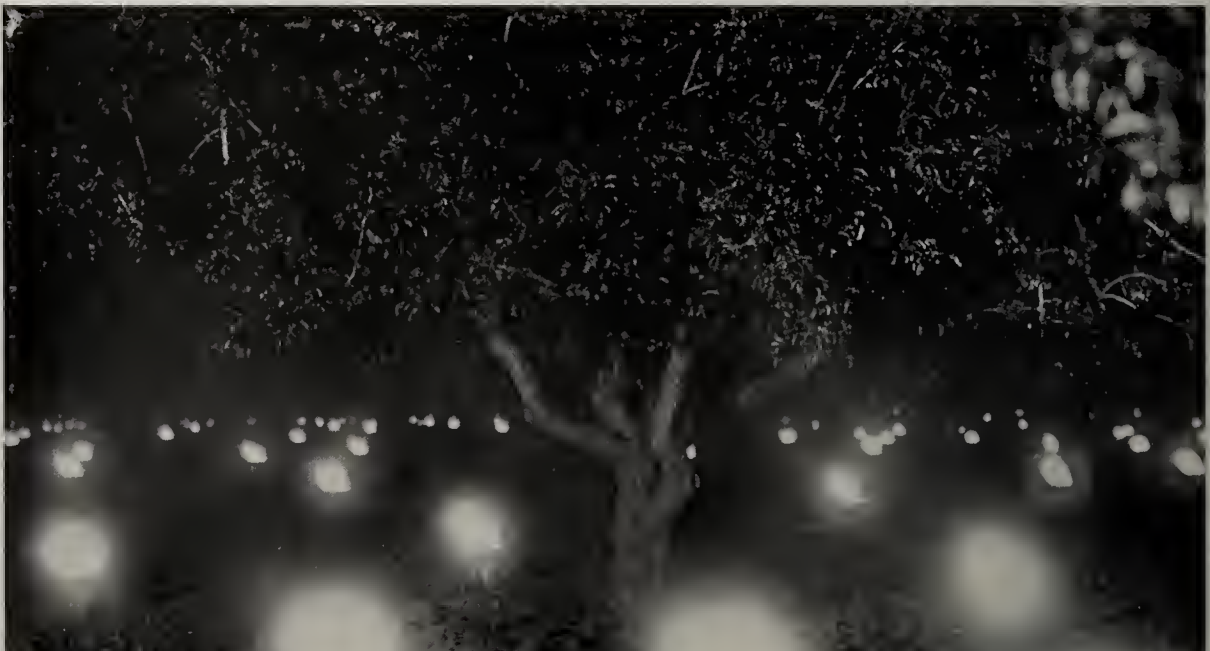

FIG. 2.

FIG. 1—Oil pots in a lemon orchard, Santa Paula, southern California. (Photo by Ford A. Carpenter, Sept. 30, 1915.)

The pots are placed one or more to a tree. They hold seven gallons each and burn crude oil in amounts depending on the heat required.

FIG. 2—Oil pots in use at Medford, Oregon. (Photo furnished by the Medford Commercial Club.)

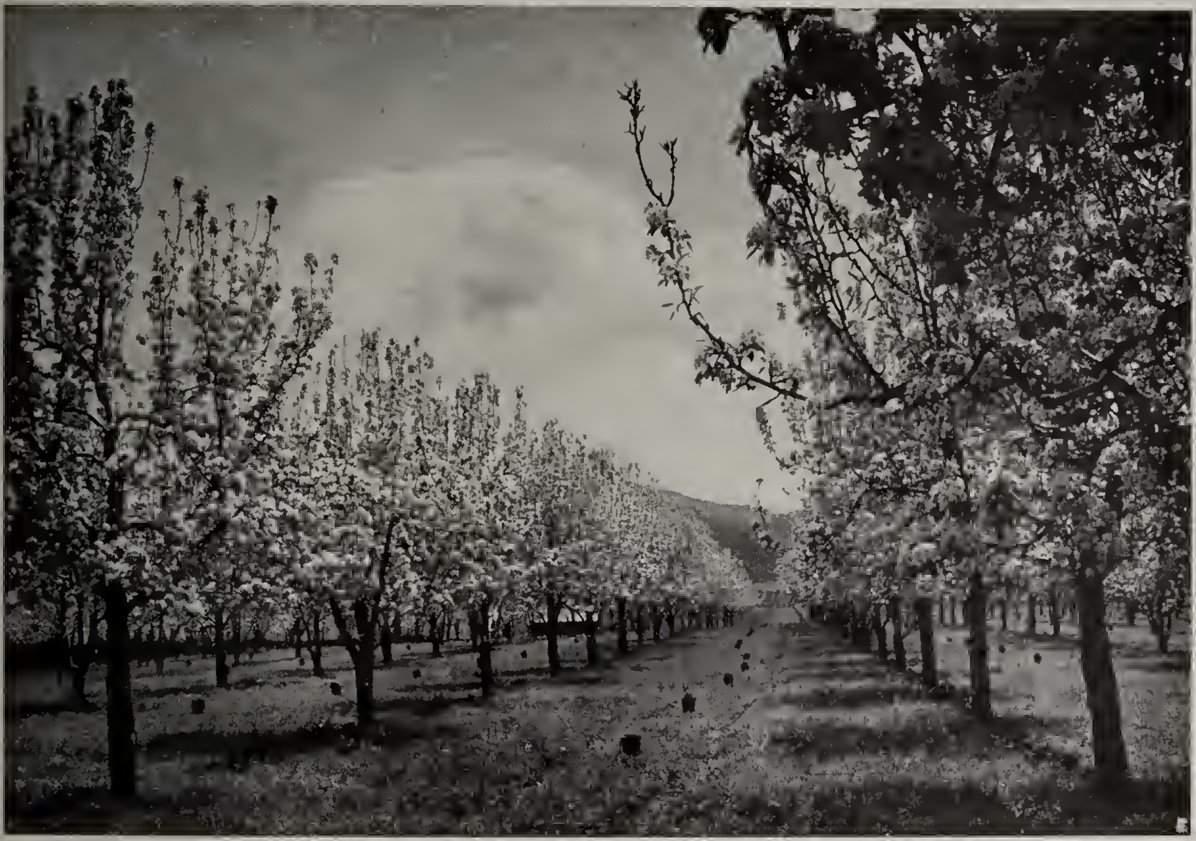

Fig. 3.

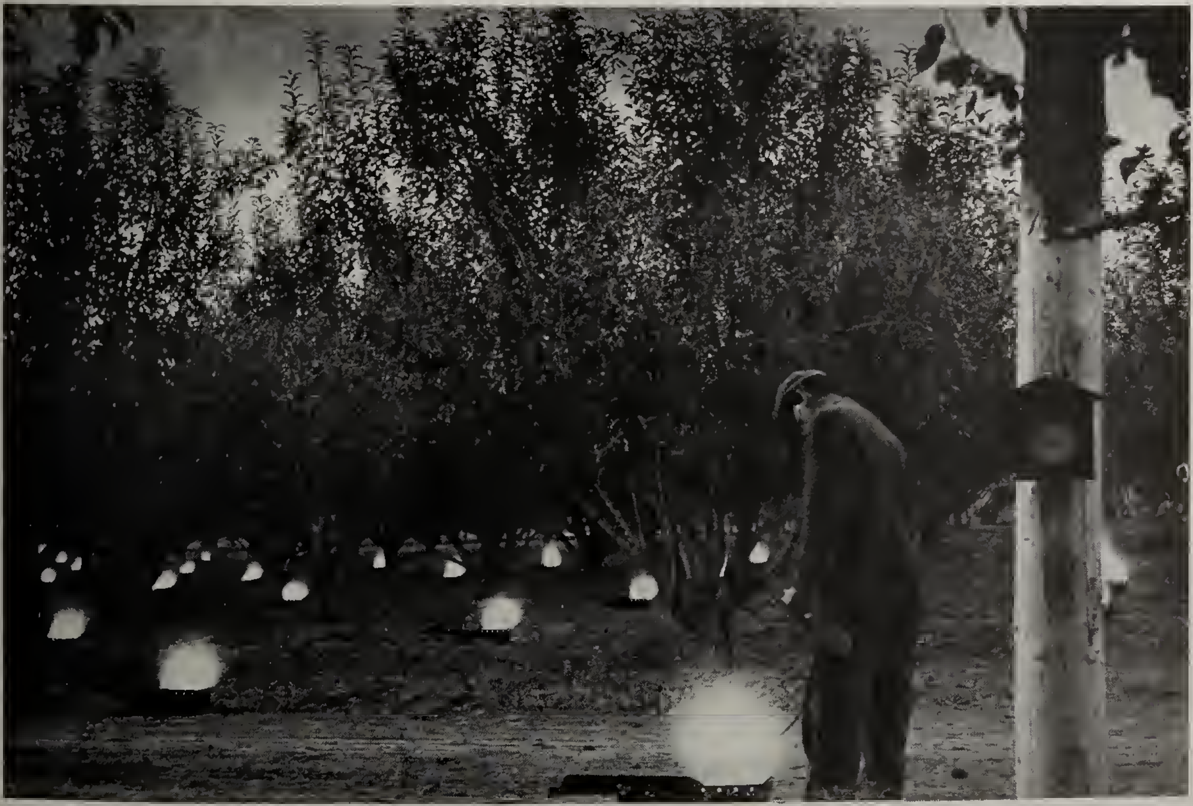

Fig. 4.

Fig. 3—Oil pots in place in an orchard at Medford, Oregon. (Photo furnished by the Medford Commercial Club.)

Fig. 4—Hamilton type of orchard heater in operation at Grand Junction, Colorado. (Photo by Frank E. Dean.)

frost damage. Temperatures may be held above the danger point by adding heat to the lower air, by checking terrestrial radiation, or by mixing the air to bring larger amounts in contact with the cooling earth.

Addition of Heat. The simplest method of preventing dangerously low temperatures is to supply heat to the lower air in amounts sufficient to make up for the loss to space. This method is wasteful because of the rapid radiation of heat to space; but it has met with considerable favor, and, combined with the checking of radiation, seems to be the most successful commercial method. Heat may be added by fires, by steam in pipes, by hot water in irrigation ditches,[6] and probably by the use of electrical energy.

Heating by small fires is the most practicable; the fires must not be large enough to scorch the plants or to start a convectional circulation; one fire to each tree is the best practice in fruit orchards. The fuel used is determined by the cost, oil in California, wood in Oregon. In spite of the effort to get ''clean burning'' fires, it is to be noted that smoke by checking radiation makes the demand for heat less severe.

Other methods of heating are far less common because they are more expensive and less flexible. Steam pipes are limited by great initial cost, besides having a fuel charge equal to fires; they are not especially effective, as radiation is not checked. The use of a flow of hot water in irrigating ditches is limited by the scarcity of water in most fruit districts, by the cost of heating, by the danger of injury to some trees by hot water, and by the tendency of irrigation to start new growth susceptible to frost damage. The use of water increases the humidity and, therefore, belongs in part to the third method. Electricity, as the most easily transported type of energy, offers interesting possibilities. The time when protection is needed, the early morning hours, is a time when the demand for power is small, but the power plants have to run. It is almost certain that some method will be devised to utilize electricity to supply the heat lost by the lower air.

Checking Terrestrial Radiation. Theoretically the best means of preventing low temperatures should be the checking of the loss of heat by radiation. If the heat loss can be prevented, the temperature will not fall to a dangerous point under hoar frost and dry freeze conditions. The loss of heat may be checked by introducing between the earth and the sky a roof of poor radiating material. Paper coverings over gardens are a type of this protection; the greenhouse is another. Lath screens form a very acceptable roof, even though covering only fifty per cent of the sky. The cost of covers is the greatest objection; all covers and roofs, except those of glass, must be removed for the plants to get sunshine, although lath roofs may be arranged with the laths north and south, so that the noonday sun is fairly strong but there is shading in the early morning.

Artificial clouds form another type of covering. A cloud cover, natural or artificial, is very effective in checking radiation. Smoke clouds are usual for protecting against frost, but there is generally a good deal of steam in the smoke. Under frost conditions the humidity is often so low that water in the clouds is rapidly evaporated and does not persist long enough to be of much use unless continually renewed. The clouds of combined smoke and stream are usually formed by burning wet straw or refuse; the usual oil fire also makes a heavy smoke which forms an effective cloud. Even very moderate winds have a tendency to carry the clouds away from the region, so that a continued supply of smoke is essential, although winds during frost conditions are always light. The development of a fine mist over the area to be protected is closely related to cloud formation. This is usually accomplished by the spray system of irrigation; devices similar to lawn sprinklers above the area have also been used. In addition to the mist formed, the evaporation of the water increases the humidity and checks radiation by the third method.

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[6] See *Increased Humidity*, below.

Increased Humidity. Any means of rendering the air less diathermanous will check radiation; in practice this is limited to the increase of the vapor content by the evaporation of water in the area to be protected. Water vapor is practically opaque to the longer waves of heat, such as those radiated from the earth; and when it is present in sufficient quantities, cooling must take place by the slow process of conduction from earth to water vapor and outward through the vapor from particle to particle, instead of by direct radiation from the ground to space. The vapor content of the air may be increased by the evaporation of water by heat; it is not necessary to boil the water, as a very slight increase in temperature will cause rapid evaporation. Another method is to supply heated water to the irrigation ditches. Both are expensive and little used, but it is possible that a small unit may be developed in connection with the use of oil pots, a unit to a tree. Sprays of water or steam also tend to increase the humidity; steam is better than water because of the higher temperature and also because of the smaller drops. The spray method gets the water directly into the air by evaporation.

The presence of water on the ground increases the humidity but not as much as steam or spray. Water in the irrigation ditches also increases the humidity, but irrigation is not regarded as good practice because of the difficulty of obtaining water, because of the tendency for new growth to start, and because wet ground makes passage through the orchard difficult when it is essential that the whole area should be readily accessible. In cranberry marshes protection by flooding is common, the plants being covered with water. Besides increasing the humidity, water on the surface of the ground decreases the effectiveness of terrestrial radiation, because water is about twice as hard to cool as dry land and a greater heat loss is required to produce the same temperature.

Mixing the Air. The only means of mixing the air on a large scale is

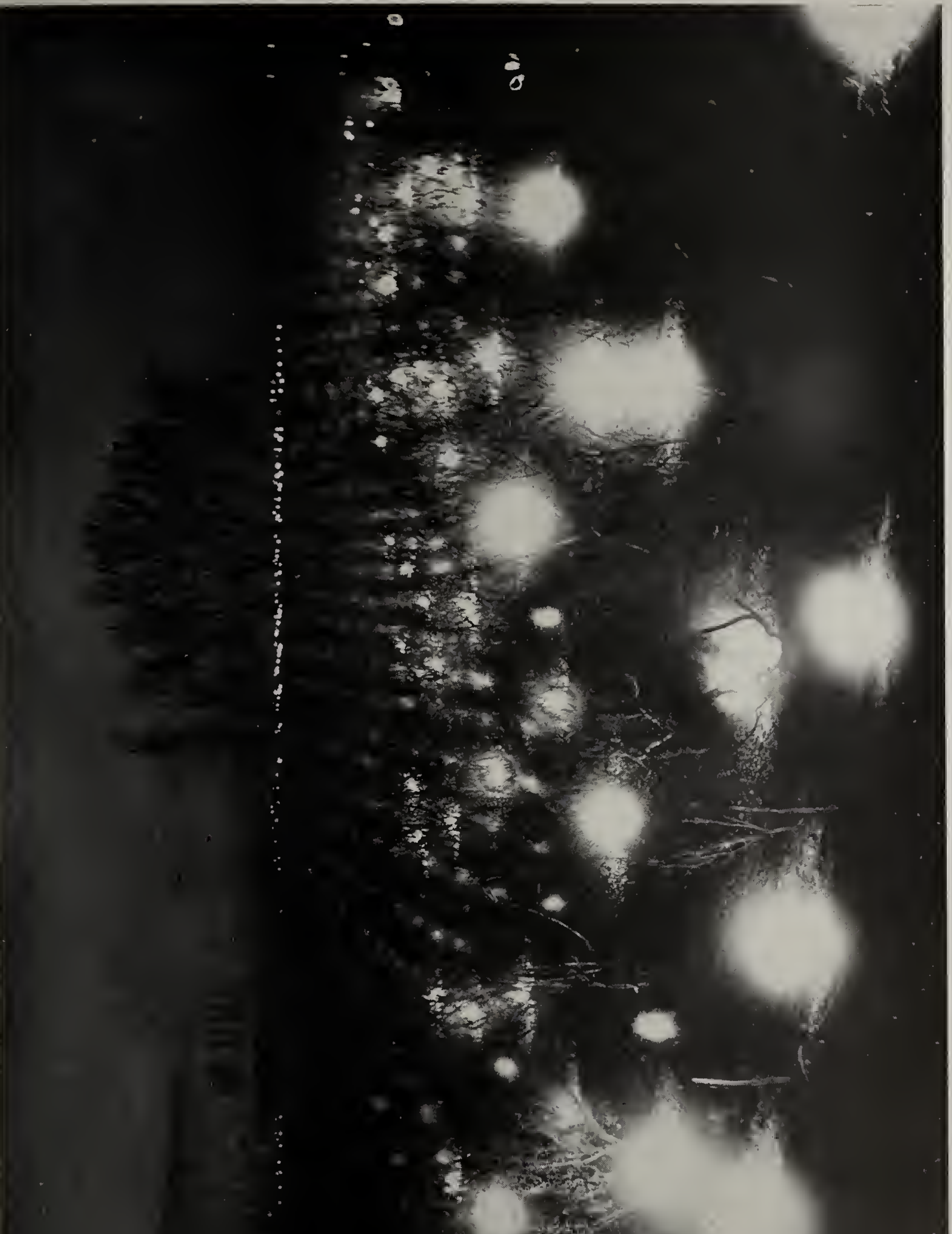

FIG. 6—Oil pots in operation at Grand Junction, Colorado. (Photo by Frank E. Dean.)

the wind; very little has been accomplished by man in this direction. Damage by cold winds has been prevented by the erection of wind-breaks, but as frost damage usually occurs in the absence of wind they are of little value. In directing feeble air currents to prevent the accumulation of cold air in "frost holes," wind-breaks may be of some value, but it is necessary to use great caution or the "holes" will be increased in area or intensity.

During frost conditions the upper air is relatively warm; it is a thin layer lying on the earth which is cooled to a dangerous temperature. If the air could be mixed so that the heat lost to the cooling earth could be supplied from a greater thickness of air, the surface layer would not become dangerously cold. It has been suggested that stirring the air by mechanical means is possible and that some device may be discovered which will draw the warmer air from aloft before the air near the earth is excessively cooled.[7] At present there is no such device nor is there any indication of how such a device can be obtained. It is quite possible that some type of machine, especially some electrical apparatus may be made to do this work; but the direct application of heat to the cooling earth without the intervention of mechanical devices seems a better method. Mixing the air has not become a practicable method of preventing frost damage.

Combinations. Many of the methods of protection in commercial use involve more than one of the foregoing physical principles. The most common method is that of small fires, which in practice give a considerable amount of smoke, even under the conditions of cleanest burning. The protection obtained is the result of the partial checking of radiation and the heating of the air to make up for the energy lost to space. Heat and moisture is a combination which depends on decreased diathermancy as well as heat supply. In most cases protection based on a single physical principle is inadequate, either because of the excessive protection necessary, smokeless heat requiring considerable heat to supply the loss through the clear dry air, or because of the necessity of perfect protection (for example, a cloud must be very dense to prevent much loss of radiation by leakage and to keep the ground above a dangerous temperature).

Protection of Frosted Plants. Frost damage may be prevented, or rather cured, by protecting the frosted plants from too rapid warming. Rapid warming, particularly by sunshine, causes the frozen water of the sap to melt near the surface of the plant or fruit while in the deeper parts the sap is still frozen; the result is that the outer cells are cut off from the source of supply and are not able to survive. Slow "defrosting" throughout the whole structure may be brought about by protecting the frosted plant while it is warming. Of course, the plant must not have been frosted for too long a time. Bright warm mornings characteristically follow the clear nights upon which frost occurs because radiant heat from even the low sun finds little difficulty in passing through the clear air.

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[7] There are, of course, very serious complications here, for adiabatic warming and cooling and adiabatic stability are involved, to say nothing of the mechanical difficulties of moving large masses of air.

Rapid warming may be prevented by shading the plants by covers or clouds. When covers are used for protection they are not removed until the danger from warming has passed; lath roofs are arranged with the laths north and south so that as the sun gets higher a smaller amount is cut off by the laths. In the absence of wind artificial clouds tend to remain well into the morning. These methods of preventing warming are also those used to check radiation; and the evil effects of frosting which are the result of imperfect protection may be prevented by the morning shading.

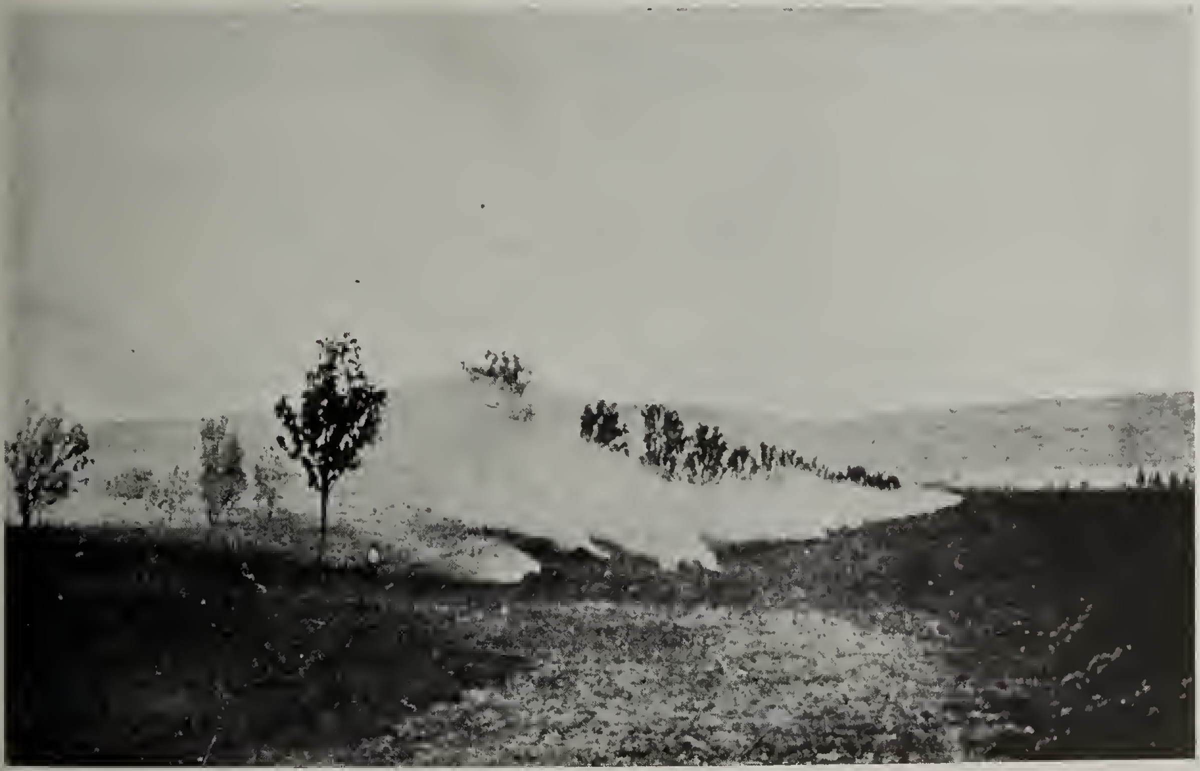

Fig. 7—Smudging in the Hollywood Orchard at Medford, Oregon. (Photo furnished by P. J. O'Gara and plate loaned by author.)

Too rapid warming may also be prevented by spraying the plants with water at a temperature of about 273°A just before sunrise. The coating of ice formed must be melted before warming can begin, and probably the energy set free by the freezing water is of some importance. The ice is said not to injure blossoms or fruit. It is, however, far better practice to prevent frosting.

Frost Forecasting. Protection against frost damage depends upon the early receipt of accurate forecasts. Weather-map studies have shown that frost is associated with definite weather types, and general forecasts of conditions favorable to frost formation are made on the basis of pressure distribution. These general forecasts are transmitted rapidly to the regions concerned, where they are applied by trained local forecasters each familiar with his region. Local forecasting of probable minimum temperatures has met with varied success. The older idea, which at first sight appears sound, that the dew point in the late afternoon is approximately the minimum temperature of the following morning, has proved too unreliable for practical use, although in some cases the dew point method has been successful.[8] Cox has found that soil temperatures seem to exert a considerable control over the occurrence of frost,[9] but the study has not yet progressed far enough to give quantitative results. Frost forecasts may be verified by the occurrence of frost or frost damage or by the occurrence of minimum temperatures of 273°A or lower with a clear sky. The temperature of the plants is several degrees lower than that shown by thermometers in standard shelters when the sky is clear, but the temperature required to damage plants is about the same amount below 273°A as this difference. Carpenter has found that in the vicinity of Los Angeles

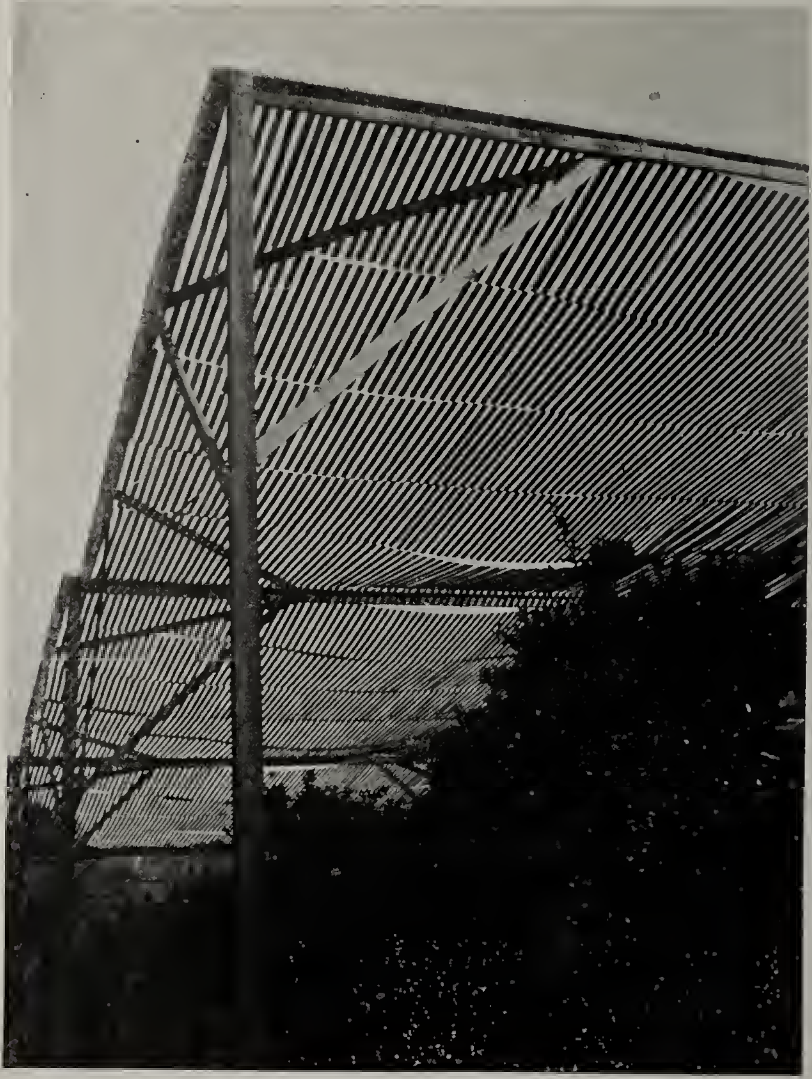

FIG. 8—Lath screen at ranch of A. J. Everest, Riverside, California. (Plate furnished by U. S. Weather Bureau.)

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[8] J. W. Smith: Frost Warnings and Orchard Heating in Ohio, *Monthly Weather Rev.*, Vol. 42, 1914, pp. 573-583; reference on pp. 579-580.

[9] H. J. Cox: Frost and Temperature Conditions in the Cranberry Marshes of Wisconsin, *U. S. Weather Bur. Bull. T*, p. 118, Washington, 1910.

a piece of bright tin freely exposed to the sky is a more constant indicator of hoar frost—not of black frost—than the vegetation; frost crystals on the tin correspond to temperature and moisture conditions giving frost. It is not possible to use temperatures at the ground or of the vegetation because of the difficulty of obtaining such temperatures and also because of the great local variation.

The final application of the forecast must be made by each grower for his own area. An exact knowledge of the spots most subject to low temperatures is of great assistance, as thermometer readings in these places will indicate when protection is necessary, especially as it is a great deal easier to prevent the temperature from falling than it is to raise it from a dangerous point. The temperatures of the coldest places will show the danger before the rest of the region is too cold, if the thermometers are read frequently during nights upon which frost is possible.

Frost Fighting. A considerable portion of the work of frost fighting has been accomplished when the campaign is planned. Fruit growers and others who have plants to protect should be fully prepared before the beginning of the season of possible danger. By this time, if fires are to be used, fuel should be on hand, the position of each fire located (oil pots in place), and the necessary labor arranged for. A definite plan of action should be prepared so that the receipt of a frost warning will set in motion an unhurried series of preparations. It is generally advisable to use the means of protection which has been found satisfactory in the region, although experiments with other methods should not be discouraged. In the case of heating and of cloud formation it is especially desirable that the same methods be used throughout whole areas, as co-operation makes the work of the individual, particularly if he is not on the edge of the district, much more effective.

Summary and Conclusion. Frost damage is the result of low temperatures due to intense local radiation at a time when the tree is unprepared to withstand the cold. It usually occurs on clear, quiet nights under anticyclonic conditions. The low temperatures can be prevented by heating the lower air to supply the loss of heat to the cold earth and by checking radiation from the earth; mixing the air is not now practicable. The methods most successful commercially depend upon the combination of heat and smoke. The best practice is fairly clean-burning small fires one to each one or two trees. Protection of frosted plants from too rapid warming often prevents damage, but there is the danger that the plants may have been too long or too severely frosted to permit recovery.

Protection from frost damage is often quite possible, if effective use is made of the information and warnings issued by the U. S. Weather Bureau. Effective protection requires some knowledge of the nature of frost damage and of the conditions under which frost occurs. A knowledge of the region, especially of the seasons of frost and of the places of lowest temperature, is also essential. The methods of protection should be studied, and the type which has proved successful in the particular region or in one where the conditions are similar should be selected. The campaign should be carefully planned in advance. Successful frost fighting depends upon co-operation by the whole community so that the campaign may be conducted intelligently and without duplication of effort; arrangements should be made for the immediate receipt of frost forecasts from the nearest office of the Weather Bureau. In the elimination of loss from frost damage alone the total expenditure for meteorology in the United States has been saved many times over. Frost damage occurs largely, if not wholly, in cases where the proper precautions have been neglected or ignored.

THE WIRELESS DETERMINATION OF THE WASHINGTON-PARIS LONGITUDE

By DAVID RINES
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The problem of determining the difference of longitude between two places on the earth's surface involves two distinct processes: an astronomical determination of the local times at the two places by star observations, and an exchange of signals in order to compare these times. The difference in the times, of course, determines the difference of longitude. The astronomical part of the problem has long been regarded as solved; and the telegraph has served as an excellent medium for transmitting the comparison signals. Nevertheless, trans-Atlantic longitude determinations, depending upon time comparisons made by cable, have not been entirely satisfactory, and the conclusion was reached that the cable cannot be relied upon for fine, accurate work.

With the advent of radiotelegraphy, astronomers, pre-eminently those of France, Germany, and Japan, began experimenting with this as a new means of comparing time signals in longitude operations. The French, by 1911, had determined, with the aid of wireless telegraphy, the differences of longitude between a number of European and French colonial points. American astronomers followed these operations closely, and when opportunity offered in 1912, the U. S. Naval Observatory suggested to the French the redetermination, by modern methods, of the longitude separating the Old World from the New.

This longitude campaign, entered upon with enthusiasm by the Observatory of Paris and the Naval Observatory at Washington, terminated about two years ago. Every move was carefully planned months before actual operations began. The instruments employed were of the highest precision, and they were so manipulated as to avoid all known sources of error. Certain innovations were found to be valuable improvements, and the results obtained give evidence of so high a degree of accuracy that the scientific world will look upon this longitude campaign not merely as an epoch-making contribution to this field of science, but as a model for future achievements.

The French began operations by carrying out an experimental longitude determination in order to test the method and ascertain the nature of the difficulties it might be expected to encounter. From Paris to Bizerte, Tunis, the greatest distance over which they had previously carried their operations, is 960 miles. The distance from Paris to Washington is four times as great; and it could not be known in advance how well radio signals could be transmitted and received over this expanse of ocean. In the spring of 1913, a party of French army and navy officers set up their astronomical instruments near the powerful wireless station at Radio, Va., and in co-operation with colleagues at Paris, began their preliminary experiment. The astronomical instrument they employed was the prismatic astrolabe, which they had used satisfactorily in previous work.[1] The oversea signals, though faint, were sufficiently clear to warrant the beginning of final operations in the following winter.

The first question was whether the Americans and the French should work together, carrying on a single plan of operations, or separately, in two parties, with two distinct series of operations, and arriving at two independent results, the one serving as a check on the other. The latter plan found favor. The French accordingly decided to have at each place an astronomer and a party of radio experts, with such installation as would enable both to work simultaneously and without interruption by the other. This was an advance over ordinary longitude operations, where the astronomer must stop work while comparison signals are being exchanged. The Americans also adopted this plan, but decided further to have an additional astronomical observer at each end so as to double the number of observing hours, and thus secure more astronomical data.

A requisite of ordinary longitude determinations is rapidity of observation, as some sources of systematic error are thereby avoided. One such source of error is that the clock ordinarily employed cannot be relied upon to run with unvarying rate for more than a short period of time. At Washington, however, the standard Riefler clock of the Naval Observatory, sealed in a glass case, is kept in a double-walled underground chamber which is artificially maintained at uniform temperature, thereby protecting the clock from changes of heat and barometic pressure. At Paris the same result is effected by keeping the standard Riefler in an underground chamber over eighty feet deep, so that daily and seasonal changes do not penetrate from the earth's surface. The clocks, under these conditions, are very accurate, and the American astronomers believed that they might safely extend their observing periods as long as desirable without risk of error due to the clocks.

It was further decided to set up the astronomical telescopes on the grounds of the respective observatories, though this placed the astronomers out of direct touch with the wireless operators at Radio and the Eiffel Tower.

Another question was the nature of the astronomical instruments to be employed. It is a principle of the German school of practical astronomy, now widely followed by astronomers, to eliminate errors during the process of observing, rather than to apply corrections for them to the final results.

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[1] See the writer's account of the astrolabe in *Engineering News*, Oct. 8, 1914, pp. 754-755, reprinted in the *Scientific American Supplement*, Dec. 12, 1914, and *Popular Astronomy*, Vol. 23, 1915, Feb., pp. 96-100.

Systematic errors are thereby avoided, and the errors entering into the results are all of the accidental class; as these are largely reduced by the multiplicity of observations, the results themselves are rendered more accurate. The ponderable telescopes of the fixed observatory, however admirably adapted to the work for which they are designed, are too much subject to systematic error to make their use advisable in longitude work of high precision. The astrolabe, moreover, was a new and comparatively untried instrument; the observatory officials planning the work therefore decided conservatively to cling to the small portable transit, reversible during the observation of each star, provided with spirit level, and equipped with self-registering transit micrometer. The micrometer reduces the systematic error due to the observer's personal equation, and reversal on each star eliminates systematic error arising from peculiarities of the instrument.[2]

For several reasons, the Naval Observatory thereupon ordered from the house of Prin, of Paris, two telescopes of the straight type, object glass about 3 inches aperture, similar to those employed by the French, with traveling micrometer operated by motor.

Since frequent reversals involve danger of jarring the instrument and thereby changing its position, notably its azimuth, means were provided for checking the azimuth in the form of meridian marks set upon piers about 150 feet from the instrument. The lenses for these marks were prepared by the makers of the instruments. Special houses with sheet-iron walls were erected to shelter the instruments. Each was provided with side shutters and a divided roof.

Another matter of importance was the kind of stars to be employed, for upon the accuracy of their catalogued positions depends the accuracy of the local times determined by their aid. The stars hitherto employed by the French for obtaining clock corrections were stars the positions of which they had themselves determined by measurements with their meridian telescope at the Paris Observatory. The Americans, not wishing to limit their choice to so small a number, relied upon the stars published in the "American Ephemeris." So far as possible they wished to observe the same stars at both stations, thereby to eliminate errors of star positions and, where this was practical, they chose many stars from the Boss catalogue. At each station the stars were so chosen as to have their deviation in position north and south of the zenith approximately balance, thereby eliminating another class of systematic errors. An exception to this rule were the stars observed for the express purpose of determining the positions of the meridian marks.

Experience in longitude work had shown that the results obtained by a single night's work, however concordant among themselves, were likely to differ from those obtained by work on other nights. Any plan of operations, to be complete, must look to the elimination of what has been termed the "night error." It is necessary for this purpose to carry on the work over an extended period. The astronomers believed that ten good nights would do. But as a "good night" meant ideal observing weather at both Paris and Washington and conditions of the ether such as would permit easy exchange of radio signals, it was thought that the work could not be completed in less than five or six months. As events proved, such an extension of time was altogether unnecessary, as, owing to the remarkable regularity of the clocks, thirty-nine nights' observations were made available.

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[2] For a discussion of these matters, see the writer's review of William Bowie's "Determination of Time, Longitude, Latitude, and Azimuth," in *Science*, Vol. 38, 1913, pp. 514-518.

Until the introduction of the transit micrometer, it had been customary to eliminate the personal equation by the observers changing places at the middle of the longitude operations. Since experience had shown that the impersonal micrometer, though greatly reducing this source of error, does not do away with it altogether, provision was made for eliminating even the small residual amount by interchange of observers between Washington and Paris.

So much for the method by which the local times were determined. We come now to a discussion of the method by which these times were compared. As the clocks at Paris and at Washington could not be accurately compared directly, the indirect process was resorted to of noting the clock readings at the moments of previously arranged signals. These signals were radio-telegraphic pulsations of the ether excited by the beats of a Leroy clock which was made to actuate the wireless mechanism. The readings of the standard clocks corresponding to the beats of the Leroy clock, coupled with the clock corrections obtained by the stellar observations, furnished material for comparison of the local times.

For further accuracy, the comparisons were effected by the "method of coincidences" commonly employed by astronomers for comparing sidereal with mean time clocks, and for this purpose the Leroy clock was arbitrarily set to keep artificial time, the beats gaining one in every 80 to 100 seconds of the standard clock. The radio expert had only to keep his attention concentrated for the moments when the beats of the Leroy approached coincidence with the beats of the standard clock, each such moment of coincidence affording an observation.

The observations were made both by ear, and photographically, with the aid of an ingenious device, invented by the French, which transformed the clock beats into flashes of light which thereupon left their impression on the photographic film. To eliminate errors of personal equation, which events proved to be of the same order of magnitude as those of the astronomers, the operators at Radio and at the Eiffel Tower, like the astronomers, exchanged places at the middle of the work.

The radio operations served a further purpose in that they furnished ieans for computing the speed of propagation of the Hertzian waves. he Paris-Bizerte longitude determination had resulted in a value for this elocity of 136,000 miles per second. The Paris-Washington result is 75,000, somewhat less than the speed of light. Owing to the greatly improved methods and the fine apparatus employed, this result must be egarded as of very high precision; but we may not on that account conlude that the velocity of the Hertzian waves is different from that of light. he explanation for the discrepancy may perhaps be found in the fact hat the radio waves, instead of following closely along the earth's surface, ollow a broken path into atmospheric regions.

It is interesting to compare the value for the trans-Atlantic longitude btained by wireless with the values obtained by cable. Reducing the able values to a common datum, we find that:

the cable of 1866 resulted in $5^h\ 17^m$	$36.^s56 \pm 0.^s090$
“ “ “ 1870 “ “	$36.^s73 \pm 0.^s056$
“ “ “ 1872 “ “	$36.^s79 \pm 0.^s051$
“ “ “ 1892 “ “	$36.^s70 \pm 0.^s024$
giving a mean value	$36.\ 69 \pm 0.^s050$

The French result has not yet been obtained, but the indications are that it will be very close to the value obtained by the American party, viz., $5^h\ 17^m\ 36.^s658 \pm 0.^s0029$.

RUSSIA'S WAR-TIME OUTLETS TO THE SEA

When the war began, Russia was immediately cut off from her convenient connectio with Great Britain and France by way of the railroad lines extending through German Turkey soon closed the Dardanelles to Russia, and the Balkan rail and Mediterranean s routes, formerly utilized by Russian trade, were no longer available. Petrograd is co nected by rail through Vologda with Archangel on the White Sea, and Russia, as is not below, is doing her utmost to increase the usefulness of that port. With the Germ fleet in the Baltic, Russia could not use this water highway to the west and she was th hemmed in, as far as the Atlantic was concerned, unless it was practical to have her mai and commodities transferred across the neutral territories of Sweden and Norway.

What has been done to solve the problem is here condensed from a paper by C. Rabo the well-known French geographer.[1] The plan, in brief, was so adequately to enlarge t present facilities for transferring passengers and freight between the railroad syste of Russia and the Scandinavian countries that Russia might have an outlet and in through their ports, thus permanently enlarging the commerce of Sweden and Norway.

Our map shows the railroad from Petrograd extending through Finland south of th Arctic Circle, touching at Gamla Karleby and Torneå, small ports on the Gulf of Bothni and connecting by rail with several other ports, including Hangö and Åbo. Within a fe days after war was declared, in August, 1914, hundreds of travelers and some thousand of pieces of baggage and freight were collected at Karungi on the Swedish side of th Torne Elf and at Torneå on the Finnish side. The stations of Torneå and Karungi we about twelve miles apart. It was impossible to store the freight under roofs or to provid shelter and sufficient food for the crowd. Much suffering was unavoidable in the earl weeks of the rush to the uninhabited wilderness, where two railroad systems have thei termini.

As fast as possible more men were employed, and hotels, restaurants, and freight house were erected. To increase the facilities for handling freight, Russia extended th Finnish line about twelve miles farther north to Karundi, opposite Karungi. This exte sion was completed on January 26, 1915. The transport of passengers and freight betwee the two railroad systems was thus reduced from over twelve miles to about two mile across the swamp and river between Karundi and Karungi. After many weeks, th Swedish terminus of Karungi was able to despatch one hundred cars a day; but even thi facility did not meet the demands of business, and many laden cars were held up at station along both the Swedish and Finnish lines, and even the Russian mails were at times delayed

Then the Swedish authorities extended their railroad along the right shore of th Torne Elf between Karungi and Haparanda so that freight and passengers could b handled along tracks on both sides of the river. Trains have been running on this branc since July last, but it will be some time before the bridge connecting Haparanda wit Torneå is completed. Meanwhile freight transports are plying between the two towns.

The situation has been wonderfully changed by these improvements, but until th bridge is completed the service is liable to be interrupted for short periods both at th beginning of winter and at the breaking up of the river ice in the spring. Traffic i also embarrassed by the fact that neither the Russian or Swedish railroad systems wer built and equipped to handle the enormous amount of business that the war has develope between these countries. The rolling stock in Sweden is especially deficient. In Marc last the Swedish railroads needed 6,000 more freight cars than were then available t handle the business. At Gotenburg, the principal center of freight distribution i veden, the docks and warehouses were packed with undelivered freight. All the Scandi-vian railroads are single track, and this has increased the congestion of freight en route.

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[1] Les communications entre la Russie et l'Europe occidentale par la Scandinavie, *La Nature*, No. 2185 Vol. 43, 1915, Aug. 14, pp. 101-105. 3 maps.

The junction of the Finnish railroad with the Swedish system has put Russia in touch th five Atlantic ports: Narvik, Trondhjem, Bergen, Christiania, and Gotenburg. The ost northern, Narvik, is the sea terminus of the trans-Lapland railroad which was ilt twelve years ago to carry the iron ore of the great mines of Gellivare and Kiruna this ice-free port for shipment. Its advantages are that it is the shortest rail route tween Petrograd and the Atlantic, about 1,150 miles; it is not subject to the delays at occur on the north-south trunk line of Sweden; and there is no deficiency of cars carry imports, as the ore-carrying cars return eastward empty. Two steamship com-nies maintain regular service between Narvik and England.

Trondhjem, Norway, a busy port, has regular connections by the Wilson Line with ull, England.

The third route passes through Christiania, the capital of Norway and leads on to ergen. This route carries the mail and passengers destined for Russia. During the last ur months of 1914 the Bergen railroad carried at least 50,000 persons going to Russia coming from it. The distance between Bergen and Petrograd is 1,819 miles via Halls-rg. The journey between London and Petrograd takes a week.

The fourth port is Christiania and the fifth is Gotenburg, the largest port of Sweden. hrough these ports passes most of the freight going to or coming from Russia, partly ecause they are most frequented by ocean liners and also because the heavy grades of e Bergen line make freight transportation slower than via the other two ports.

Russian transit is using not only railroads in Sweden and Norway but also, to some tent, the sea route through the Gulf of Bothnia. This gulf is almost isolated from the st of the Baltic by the Åland Archipelago. Between this jumble of islands, islets, and efs, prolonging Finland into the sea, and the coast of Sweden, there is only one wide assage, the Ålands Haf, so sown with dangers that any false move invites disaster. erman warships do not venture into these waters, but an occasional submarine from ne or another of the German Baltic ports has made dangerous the approaches to Åbo nd other southwestern Finnish ports. A number of steamers have been destroyed by ines especially in the waters around Åbo.

Meanwhile, Archangel, as, prior to this winter, the only port of European Russia still pen to trade, has sprung into great prominence.[2] Last summer there were about 120 teamers in port. Many boats and barges were also engaged in river and canal naviga-ion, some of them carrying as much as 2,000 tons each. The Northern Dvina River at rchangel is one to three miles wide, with a depth of twenty to forty feet. The White ea tide rises about three feet. The depth of water at the piers is usually twenty-two feet r more at low tide. Over one hundred large warehouses have been built within a year. here are still too few piers and warehouses, and ships arriving sometimes have to lie out n the stream for weeks before they can unload. One American steamer took five weeks o discharge its cargo.

Large preparations are planned to meet next spring's traffic, and it is hoped that acilities may then be sufficient to take care of the enormous business. If Archangel ere free from ice in winter it would be one of the finest ports in the world, as it has ver sixty miles of river frontage available for ships drawing up to twenty-three feet. oreover, through the system of inland waterways with which the Northern Dvina River s connected, it is possible to ship freight from Archangel by water to nearly all the rincipal towns of Russia.

The river begins freezing in October, but it is hoped to keep the White Sea open a onth or two later. Two of the largest ice breakers are now at Archangel, the *Canada*

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[2] H. D. Baker: Rapid Progress of the Port of Archangel, *Commerce Repts.*, Oct. 18, 1915, pp. 254-260 abstracted in *Bull. Geogr. Soc. Philadelphia*, Vol. 14, 1916, No. 1, pp. 24-29); Further Improvements at rchangel, *Commerce Repts.*, Nov. 1, 1915, pp. 450-452.

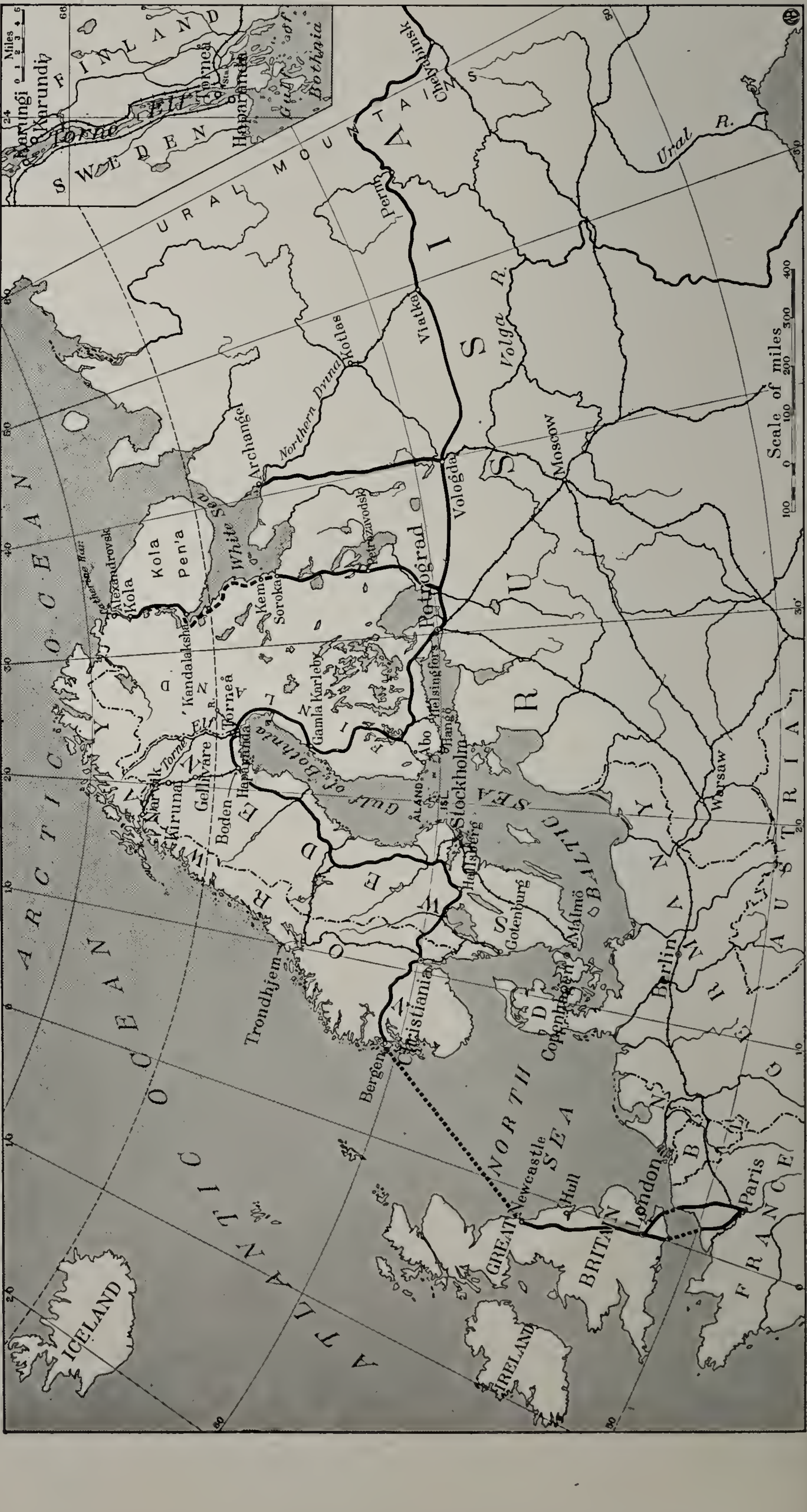

Fig. 1—Sketch-map of Russia's war-time outlets to the sea in northern Europe. Scale, 1:24,500,000. The inset shows the junction of the Russian and Swedish railroad

and *Lintrose,* and several more are being constructed in England for use during the winter. In the latter part of the season incoming ships may be allowed, as they were last year, to freeze in, unloading their cargoes on the ice.

The railroad connection of Archangel with the interior has also been materially improved. The single-track narrow-gage line, 395 miles long, which connects the port with the main railroad system at Vologda, has been changed to standard gage. North from Nyandoma, half-way between Archangel and Vologda, a parallel single track has been built, while south of this point the present tracks have been widened. The freight cars that can now be used have a capacity of fourteen as against ten tons (of 2,240 pounds) with the former equipment. In addition to the consequent heavier freight movement, there will be a great saving of time, as it will be possible to run cars from all parts of Russia and Siberia through to Archangel without transshipment at Vologda.

In spite of this larger capacity of Archangel, the fact that, even by using ice-breakers, the port cannot be kept open for three to four months has revived the plan of providing Russia with an outlet by means of the ice-free stretch of Arctic coast which extends immediately east of the northernmost part of Norway. Here an offshoot of the Gulf Stream drift, which rounds North Cape, keeps the waters open the year round. Catherine Harbor, a deep estuary which extends for 27 miles into the land, affords an ideal haven for shipping. At its head lies Kola, until recently a settlement of fishermen and fur hunters. From here a double-track railroad has been under construction during the past months to Petrograd, about 815 miles distant. According to latest reports the essential parts have been finished in time to replace the Archangel route during the present winter.[3]

Construction has not been easy. The line passes through the glaciated, lake-studded region of northwestern Russia. Many miles of road had to be built on piles, and through long stretches of swamp and morass a firm roadbed had first to be provided. The swarm of mosquitoes and midges characteristic of Arctic summers made the work particularly trying. Nevertheless progress was made at a remarkable rate, and the line was completed three weeks before contract time.[4]

The line strikes due south across the neck of the Kola Peninsula to Kandalaksha, at the northwestern tip of the White Sea, a distance of 179 miles. It then skirts the western border of the White Sea to Soroka, at its southwestern extremity, a distance of 258 miles. From here it continues southward to Petrozavodsk on Lake Onega, a distance of 237 miles, and then runs south-southwest to Svanka, a station on the main trunk line east from Petrograd, and reaches the capital in about 240 miles more. The line is reported to be completed except for the section along the western border of the White Sea. Between the end-points of this section, Kandalaksha and Soroka, it is proposed to maintain traffic by water by means of three ice-breakers, one of 2,500-ton and two of 500-ton capacity, which will likewise serve as cargo boats. The ice along the west coast of the White Sea is of very light formation and affords no such obstacle as the heavy ice which is forced into the entrance to the White Sea by northerly and northeasterly winds and effectually bottles up Archangel during the winter.

Owing to the limited capacity of the ice-breakers this route will probably be reserved for freight urgently required by the government. Private freight arriving at Kola during the winter will be moved as far south as Kandalaksha by rail and can then be transported westward a distance of 140 miles by sledge to Rovaniemi, a town on the Arctic circle (indicated by R on the map) at the end of a branch from the Finnish railroad around the Gulf of Bothnia. Even when the uncompleted section of the railroad has been finished the Kola route will hardly, in summer at least, replace the Archangel route, because of the shorter railway haul on the latter. However, Soroka and the important coast town of Kem, 35 miles north, can serve as additional ports of entry to relieve any congestion on the Archangel route. With this in view, dredging and construction work have been under way during the past months at these two ports.

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[3] The Railway to the Murman Coast of Russia, *Commerce Repts.* (from the *London Times Russian Supplement*, Oct. 30), Dec. 9. 1915, pp. 970-973, with map. See also North Winship: Existing and Proposed Russian Arctic Ports, *Commerce Repts.*, March 19, 1915, pp. 1109-1111; H. D. Baker: *op. cit.* in footnote 2 (references on pp. 257 and 450); Verbinding van St. Petersburg (Petrograd) met de Noordelikje IJszee, *Tijdschr. Kon. Nederl. Aardrijksk. Genoot.*, Vol. 32, 1915, No. 7, p. 889; Järnvägen Petrograd-Ishafskusten, *Ymer*, Vol. 35, 1915, No. 3, p. 298; Fertigstellung der Eisenbahnlinie Petersburg-Kola-Katharinenhafen?, *Weltwirtschaft*, Vol. 5, 1915, No. 8, p. 170.

[4] Article in the *New York Sun*, Jan. 9, 1916.

Such are the means by which Russia has broken through the bonds imposed on her by the war and gained an unobstructed access to the western sea. To the east her communication with the Pacific, by means of the Trans-Siberian railroad, has not been hindered, but obviously a single line, many thousands of miles in length, cannot properly serve her needs. Russia has thus been forced to create new lines of communication with the western world. While these are in part circuitous and one, the Kola route, only inadequately satisfies Russia's age-long desire to reach an ice-free coast, they will contribute permanently to the economic welfare of the Empire.

THE WASHINGTON MEETING OF THE ASSOCIATION OF AMERICAN GEOGRAPHERS

The twelfth annual meeting of the Association of American Geographers was held at Washington, D. C., December 30-31, 1915, and January 1, 1916. Forty-one members were present and more than that number of invited guests.

Of the forty papers announced, the following twenty-five were read. In most cases, brief characterizations of the papers are given, based on abstracts supplied by the authors.

General

William Bowie (introduced)—*The Place of Geodesy in Scientific Geography.*

Geodesy is essential in the determination of the shape and size of the earth. From the data secured from geodetic observations we are enabled to determine approximate deviations from the normal in the densities in the outer portions of the earth. By means of triangulation and geodetic leveling the fundamental control in position and elevation is obtained for surveys and maps.

Dora Keen (introduced)—*Avalanches as a Factor in the Alimentation of Glaciers.*

William G. Reed—*The Probability of Specified Meteorological Conditions.*

A knowledge of the "business risk" from unfavorable weather conditions is essential for successful farming. The "probability curve" may be used to determine this risk. As an illustration of what may be done a map of the dates after which killing frost will occur only one year in ten on the average was shown. Similar maps have been made for autumn frosts and for the probable season without killing frost four years in five.

Ellsworth Huntington—*Geographic Variables.*

Every geographer recognizes that the effect of geographic environment varies. This variation has two aspects. In the first place man's own capacities vary greatly from region to region and in different stages of development. Therefore a region such as the grassy prairies, which at one stage presents an insuperable obstacle to agriculture, may in a later stage become the region where agriculture is most profitable. The second type of variation is due to the fact that certain phases of geographic environment, especially the climatic conditions, change markedly from year to year and cycle to cycle. The work of Clayton on rainfall and panics, of Brückner on rainfall and migrations, of the British officials in India on famines, birth-rates, crime, and social conditions, of Moore on crops and economic cycles in the United States, and of Dexter on weather and conduct, are samples of an immense body of facts which belong to the realm of geographic variables. One of the next great steps in the science of geography is, perhaps, to correlate these facts, and to show how geographic variables, such as rainfall or other conditions of climate, give rise to a long series of constantly changing results, beginning with crops and annual migrations and going on to the prosperity of the farmers, fishermen, and others, the activity of merchants, the productivity of factories, the scale of general prices, the occurrence of financial panics, the amount of poverty and crime, and the play of all these conditions upon the world's political and social fabric. Such a treatment leads into the fields of biology on one side and of economics and history on the other, but geography can never occupy its rightful place without it.

R. H. Whitbeck—*Geographic Environment as a Factor in Evolution and in Race Differentiation.*

The influence of geographic environment is one of the basic questions of scientific geography. At the bottom, it is a biological question,—Can environment so act upon organisms as to progressively modify them and eventually produce wide variations from the parent stock? If so, how is it accomplished? Are differences in environment, and are changes in environmental conditions competent to bring about the present differentiations among groups of plants, animals, and men?

John L. Rich (introduced)—*Correlation of Cultural Features with Stage in the Erosion Cycle.*

Since cultural features—as roads, houses, clearings, villages, and cities—are the outward expression of the life of the people, their control by natural conditions such as relief, slope, or climate may be taken as a partial measure of the influences which the latter exert upon the activities of the people of the region under investigation. Quantitative measurements of the distribution of three cultural features—roads, houses, and towns—were made for typical examples of topography in each stage of the erosion cycle and their results expressed in percentages and correlated by means of graphs. In infancy and youth *upland culture* predominates; clearings, roads, houses, and towns are on the uplands while the valleys are avoided. With advance toward early maturity, culture descends more and more into the valleys until, in early maturity, *valley culture* prevails. With advance toward late maturity and old age *slope culture* begins to dominate and increases progressively until, in the final stage, peneplanation, *universal culture* is inaugurated.

Charles R. Dryer—*Studies in Economic Geography. I. Definitions and Classifications. II. The Economic Regions of the United States.*

I. A workable organization of economic geography was proposed, consisting of basic definitions and classifications of environments, economies, and economic societies.

II. On the basis provided in (I), the United States was divided into five natural economic regions, the leading environmental and economic factors of each region were discussed, and the rank among economic societies which appears to belong to each was assigned.

Hiram Bingham—*Methods Followed in the Field Work of the Peruvian Expedition of Yale University and the National Geographic Society.*

In organizing the Peruvian expeditions it has been the aim to include representatives of as many different sciences as possible. The field method has been to send a reconnaissance party to construct route maps, take many photographs, establish friendly relations with local officials, landowners, and natives, and learn all possible regarding climatic conditions and the sources of food supply for the animals. This determines the character of future work. A topographic party is next sent into the field to make a map which shall show roads, rivers, bridges, important peaks, and other salient features, as desired by the parties that are to follow. Finally, armed with blue-prints of the maps, with photographs and reports of previous parties, the trained specialist, be he geologist, zoologist, or archeologist, can go immediately to work, and gain the best results.

Albert Perry Brigham—*A Type of Geographical Description.*

Various kinds of descriptions were noticed, as more or less geographical, such as those of the encyclopedia, the census, the guide book, the elementary text book, the special treatise, accounts of exploration and survey, and the records and impressions of travel. Our modern geography should produce a type differing from all of these, mature in subject-matter, complete in its use of principles, finished in literary form, drawing from all sources, and suited not only to teachers and all other educated persons, but to the professional geographer who needs to know the unit considered, not in detail but in substance and total.

ROBERT M. BROWN—*The Need of Considering Minimum Essentials in Geography.*

The paper presented the following points: brief outline of three or four proposals; statement of the demands of educational experts; call on the specialist to insist on a content of broad scope and to give thought to the possibilities of testing knowledge and ability in geography.

REGIONAL

ROBERT DEC. WARD—*The Prevailing Winds of the United States.*

The wind directions as usually shown, by means of arrows (an arrow for each Weather Bureau station), on our daily weather maps and on our annual and monthly charts of wind directions do not give us the view which we need for purposes of broad climatic description. The ordinary wind charts emphasize too much the local peculiarities of each station. What we most want to know is the sweep of our winds: our wind systems, so far as we may indicate them, over the different sections of the country. The prevailing winds for January and for July were thus broadly generalized, on two charts.

OLIVER E. BAKER—*A Map Showing the Agricultural, Forest, and Grazing Areas of the United States.*

C. F. MARBUT—*The Dark-Colored Soils of the United States and Their Agriculture.*

The work of Russian investigators on the dark-colored soils of Russia and Siberia has attracted a great deal of attention during the last few years. The character of these soils and the geographic conditions under which they have been developed were described briefly, and the dark-colored soils of the United States were compared with them in character, distribution, and origin. The agriculture on the dark-colored soils of the United States was briefly discussed by means of a comparison of a soil distribution map and agricultural maps.

ALBERT PERRY BRIGHAM—*The Population of New York State.*

The following topics were discussed: growth as compared with that of typical states in the South, the North-Central region and the West; center of population and its movement; population in relation to altitude, physiographic provinces, and drainage basins; urban and rural population; rural population as related to quality of soil and proximity of cities; belt of dense population as dependent on soil, climate, and facilities for transportation; capacity for population.

F. V. EMERSON—*Geographic Factors and Cane Sugar.*

The cultivation of sugar cane, a tropical plant, in the warm temperate climate of Louisiana and Texas presents some difficulties, and these conditions are reflected in the economic, sociological, and political life of the people.

Sugar cane ordinarily makes a good growth in Louisiana, but harvesting time is somewhat critical. A hard freeze before cutting will usually spoil the entire crop; the sugar content is altered by conditions of sunshine, temperature, relative humidity, and rainfall. Such climatic limitations render the industry somewhat precarious as compared with the great staples, cotton, corn, and wheat. The industry requires expensive, intensive cultivation during the growing season, rather quick gathering during the harvesting period, and fairly prompt sugar extraction during the ''grinding season.''

Several anthropogeographic responses result from these conditions. The relative uncertainty of the crop together with the extremely profitable yields in favorable years attract venturesome *entrepreneurs* either possessed of, or, more frequently, able to borrow, considerable capital. Expensive cultivation and handling strongly tend to large-scale management and to large plantations instead of moderate-sized farms. This tendency is enhanced by the fact that it is a decided advantage to the planter in securing prompt treatment of his product to own or control his own manufacturing plant, and the tendency is therefore toward the control of plantations by capitalists or corporations. Hence it is that the large, somewhat self-sufficing plantation is rather characteristic of the sugar district.

HENRY J. COX—*Influence of the Great Lakes upon the Movement of High and Low Pressure Areas.*

The Great Lakes influence to a certain extent the movement of high and low pressure areas which cross the North-Central states. Because of the higher temperature of the lake water in the colder months of the year as compared with the air temperature in the urrounding area there is a tendency for ''highs'' to avoid and ''lows'' to seek the lake oute, and in the warmer months the converse is true. In the colder months there is a endency for the pressure to decrease in ''highs'' and ''lows'' crossing the lakes, while n the warmer months the pressure tends to increase. ''Highs'' often develop over the ake region in the springtime and remain for a considerable period, thus insuring proracted fair weather.

Ioward E. Simpson (introduced)—*The Islands of Devils Lake, North Dakota, and Their Significance.*

A sketch of the origin and life history of the ice-built boulder piles in a rapidly disppearing glacial lake, with the additional evidence which they offer of the pulsatory limatic changes which have taken place in the Northwest since the close of the Glacial eriod.

I. L. Shantz (introduced)—*Correlation of Natural Vegetation, Soil Type, and Early Settlement in Eastern Colorado.*

The principal plant associations of eastern Colorado, the relation of these associations o soil type, and the relation of vegetation type and soil type to grazing and crop proluction. The distribution of the plant associations was shown by sketch maps.

V. M. Davis—*The Mission Range, Montana.*

In recognition of the greater value in geographic description of the present than of a ast tense, an account was given of what the Mission Range *is* rather than, as on the ccasion of the Princeton meeting two years ago, of the processes of uplift, dissection, and laciation, by which it *has been* formed.

F. E. Matthes—*The Post-Pleistocene Moraines of the Sierra Nevada.*

Short but conspicuous moraine loops occur in front of all the small glaciers of the Sierra Nevada, as well as in a large number of empty cirques along the crest of the range. Their remarkably fresh appearance, in contrast with which even the younger members of the extensive Pleistocene moraine series seem subdued and ancient-looking, suggests strongly their deposition during post-Pleistocene and, in part at least, historic times. Those last formed are comparable to the recent moraines of Switzerland and Savoy, which, through documentary evidence, have been identified as witnesses of moderate glacier pulsations that occurred during the eighteenth and nineteenth centuries.

The desirability at once suggests itself of a correlation of this record of post-Pleistocene climatic fluctuations with that contained in the rings of the sequoias of the Sierra Nevada, on the one hand, and with that contained in the strand levels about Mono Lake and Owens Lake, on the other.

The conclusions are important in the study of glacial cirques, inasmuch as cirques containing such moraines must be considered as having been recently ''renovated.'' They are not directly comparable to cirques that have been empty since the close of the last glacial epoch.

C. F. Marbut—*The Relation of Soils to Crops in Southern California.*

A soil map and a crop map, both worked out in detail, presented not only the geography of the various crops but also the relations of the various crops to the soils of the San Bernardino Valley.

Alfred H. Brooks—*The Physiographic Provinces of Alaska.*

Five principal physiographic provinces are recognized in Alaska, each one of which is divisible into a number of sub-provinces. These, named from south to north, are: the Pacific Mountain System, the Central Plateau Region, the Rocky Mountain System, the Arctic Mountain System, and the Arctic Slope Region. In this classification a new term, the Arctic Mountain System, is introduced to include the mountain chain which traverses northern Alaska and parallels the Arctic Ocean. It was previously believed that it was an extension of the Canadian Rockies, but this interpretation has proved to be in error both from a tectonic and physiographic standpoint.

Alfred H. Brooks—*The Geography of Alaska in Its Relation to Man.*

Geography has controlled the distribution and cultural development of the Alaska natives and, to a large extent, the approach to and occupation of the territory by the white man. This control has been exercised principally through geographic position, by character of relief, drainage, and shore line, by climate, and by distribution of animals and vegetation. The habits and distribution of the native population are the direct result of physical environment, due, in turn, to the interaction between various geographic factors. The distribution of animals and vegetation and the physical barriers to migration have been the controlling geographic influences on the natives of Alaska.

All of the geographic factors listed above have influenced to a greater or less extent the advance of the white man in Alaska. The first settlements in what is now Alaska were determined by the needs of the fur trade. Later, settlements were located to meet the needs of the fisheries, while in recent years a new factor has dominated, for the distribution of mineral resources has largely determined the centers of population.

PHILIP S. SMITH—*Notes on the Exploration of the Lake Clark-Iditarod Region, Alaska.*

The region extends from the western flanks of the Pacific Mountains well in to the Central Plateau province of Alaska. A narrative account of the expedition and a general summary of the topographic features, climate, vegetation, settlements, and population were given.

J. RUSSELL SMITH—*The Island and the Continent at War.*

The conflict between England and Germany was traced in part to contrasting geographical conditions. The continental location of Germany, exposing her to invasion on nearly every side, naturally developed fear of her neighbors and this, in turn, bred a respect in her people for any kind of authority that could protect them. Hence their obedience to military organization and individual subordination.

England, on the other hand, has been free from any danger without, because of her insularity and her fleet. This has led to greater political and individual freedom, but also to a greater laxity of organization, as evidenced by internal political dissensions and the relative neglect of education and science.

The address of the President, Professor Richard E. Dodge, on ''Some Problems in Geographic Education, with Special Reference to the Secondary School'' was given at the opening of the afternoon session on December 30. On the evening of the same day there was a symposium on methods of geographic exploration. The following evening, at the informal conference on the work of the committee on the physiographic boundaries of the United States, Professor N. M. Fenneman, chairman, reported that an agreement as to a working basis—the most important problem before the committee—had been reached and that one province had been outlined. The members of this committee are: N. M. Fenneman, Eliot Blackwelder, Marius R. Campbell, D. W. Johnson, and F. E. Matthes.

An exhibit had been arranged by the local members showing some recent work of the government bureaus whose activities are of a geographic nature. The U. S. Geological Survey displayed a series of maps to illustrate its recent experiments in the representation of generalized relief by shading rather than by contours. These included the standard base map of the United States, 1:2,500,000, and the recently published outline map of Alaska, 1:1,500,000, for parts of which relief was shown in manuscript. Shading had also been added to one half of the Mt. Rainier sheet, strikingly bringing out the plasticity of this half of the mountain as compared with the unshaded, contoured half. Other maps exhibited were the general relief map of the United States (in manuscript) to appear in the agricultural atlas in preparation by the Department of Agriculture, and sets of the boundary maps, 1:62,500, embodying the recent surveys of the 141st meridian (Alaska-Canada) and the 49th parallel from the Rocky Mountains to Puget Sound.

On two occasions the members were guests of the National Geographic Society at luncheon. At one of these, in the Society's building, there was a remarkable and highly appreciated exhibit of geographical photographs from the Peruvian collections obtained by Prof. Hiram Bingham.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

New Fellows of the Society; Monthly Meetings of November and December. A regular monthly meeting of the Society was held at the Engineering Societies' Building, 29 West Thirty-ninth Street, on Tuesday evening, November 23, 1915. Vice-President Greenough, Chairman of the Council, presented by name the following thirty-six persons, recommended by the Council for election as Fellows, and after a vote they were declared elected.

Samuel Abbott
Walter Adams
Gardner W. Allen
Gilbert Allis
C. L. G. Anderson
Mrs. Richard G. Babbage
Jorge A. Boerol
William D. Boyce
G. J. Bruce
Philip T. Coolidge
Joseph S. Diller
George M. Douglas
Elizabeth F. Fisher
N. Dwight Harris
E. Lester Jones
Nand Lal
Henry Goddard Leach
Frank Leverett
John J. Lordan
Seth Low, II
Deodoro Moegle
Frederick K. Morris
Joseph Edward Otis, Jr.
Sidney Paige
Harold S. Palmer
Paul S. Phenix
G. C. Piché
Elizabeth K. Reynolds
Heinrich Ries
Waterman S. C. Russell
Hidezô Simotomai
Harold Vincent Smith
Millicent Todd
Stephen Sargent Visher
Wallace O. Westfeldt
Lucy L. W. Wilson

Mr. Henry R. Rose, D.D., then addressed the Society on "The Countries at War."

At the regular monthly meeting on Tuesday evening, December 21, 1915, the following thirty-four persons, recommended by the Council, were presented by name by Vice-President Greenough for election as Fellows, and after a vote they were declared elected.

William Billings Aspinwall
Kimball C. Atwood, Jr.
Elliot C. Bacon
Paul V. Bacon
Arthur D. Baldwin
David F. Barrow
Florence Bascom
Theodore S. Beecher
Silas P. Beebe
A. C. Boyle, Jr.
Amos F. Breed
Templeton Briggs
Walter B. Briggs
William Gray Brooks
Charles S. Brown, Jr.
Frederic King Butters
Charles H. Calusdian
Henry Harmon Chamberlin
R. Percy Chittenden
Cornelius E. Donnellon
Laura Hatch
Florrie Holzwasser
Elbridge C. Jacobs
W. C. Mendenhall
Bertha Merrill
Gustavus Myers
P. E. Pieris
Hamilton Rice
Deette Rolfe
Carl O. Sauer
Joseph F. Simmons
Hilda Stam
May G. Taylor
Russell A. Wood

Prof. Will S. Monroe, F.A.G.S., then addressed the Society on "The Balkan Peninsula."

NORTH AMERICA

Physiographic Excursion to the Western United States. The Columbia University Physiographic Excursion to the West, led by Prof. Douglas W. Johnson, was one of the important geographical events of the past year. There were thirty-three members of the party, including Prof. Florence Bascom, Bryn Mawr; Prof. A. C. Boyle, University of Wyoming; Prof. E. C. Jacobs, University of Vermont; Prof. I. H. Ogilvie, Barnard College; Prof. C. W. Brown, Brown University; Miss Dora Keen of Philadelphia; a number of school teachers of New York, Trenton, and other cities, and students of Columbia University.

The party left New York on July 4. Yellowstone Park was entered via Billings and Cody. Cody stands on a terrace of gravels above the Shoshone River, a true plains town. The mountain range just west of Cody, forming an outlier of the Absaroka Range, is structurally an anticline with a north-south axis. Its limbs are flanked by a splendid series of hogbacks, those on the east being partially buried in the more recent gravel deposits. West of the anticline a north-south valley, carved on some of the less resistant sedimentaries, is used as a pounding reservoir for the artificial Shoshone Lake. The great Shoshone Dam is built on the west flank of the anticline, where the river, cutting across the range, passes from the valley opened out on the sedimentaries into the steep-walled gorge cut through the crystalline axis. The main portion of the Absaroka Range, forming the eastern barrier of the Yellowstone basin, is a maturely dissected and glaciated plateau whose horizontal beds consist of lava flows and volcanic agglomerates. From anywhere within the Park it appears rugged and serrate on the skyline. The wonderful all-day ride through the Shoshone Canyon and over the Absaroka Range, terminating in the rapid descent into the Yellowstone, made a profound impression upon everyone.

Five days were spent in Yellowstone Park with stops at Yellowstone Lake, the different geyser basins, the Grand Canyon, and Mammoth Hot Springs. A half day's trip to the top of Mount Washburn gave an excellent opportunity to study the broken character of the Yellowstone Park plateau, with its encircling mountains and deeply entrenched canyons. Mount Washburn and its associated peaks apparently do not represent the remnant of one of the old volcanoes which supplied the lava-filling for the Yellowstone basin, as has been suggested; but rather the mountain is a sharply tilted and much-dissected block of an older series of lavas, possibly equivalent in date to those of the Absarokas.

The ride from Gardiner down the Yellowstone valley gave the party an opportunity to see the terraces of the Yellowstone River cut in fluvio-glacial gravels, a rather recent lava flow capping the gravels and extending across the valley, except where cut through by the river. A day's ride across the plains brought the party to Glacier National Park.

The first day's outing was by automobile along the east front of the Rockies, giving opportunity to study the famous Lewis thrust fault, the glacial troughs of the Two Medicine Lakes, St. Mary Lake, Lower St. Mary Lake, and Swiftcurrent Creek, as well as glacial moraines on the neighboring plains. Two days were spent at Many Glacier Camp, from which a tramp of fourteen miles was made to Iceberg Lake, a typical glacial tarn occupying a symmetrical cirque whose sheer walls rise over 3,000 feet above the lake surface. The next day a horseback ride of twenty-three miles over Piegan Pass brought the party to Upper St. Mary Lake. Two days here, a boat ride down the lake, a tramp to Gunsight Camp with a night there, a hard climb over Gunsight Pass to Sperry, another night within a mile of Sperry Glacier, and finally a tramp down to Lake McDonald and the railroad, supplied a wonderful panorama.

Grand Coulee, Washington, an old abandoned channel or canyon of the Columbia River, showed features reminiscent of a former occupancy by water: "fossil" waterfalls larger than Niagara with plunge pools at the base even now filled with water; old river bottoms; and islands rising above the former river bed. Then came a study of Lake Chelan on the east slope of the Cascades, a region made classic ground for the geographer by Henry Gannett's paper, in which, for the first time, the essential relation between glacial troughs and hanging valleys was made clear. The party was much impressed by the fact that so valuable a paper should have been based on a locality where the trough and hanging valleys were so imperfectly developed.

At Medford, Oregon, a trip to Table Mountain was arranged by the Medford Commercial Club. From Medford the party enjoyed an all-day automobile ride through the Cascade forests to Crater Lake. Two days were given to a study of features along the rim and a trip to the cinder cone of Wizard Island within the depression. On the third day the party descended the eastern side of the Cascades into the Great Basin, where remarkable examples of very young fault-block mountains were observed en route to Klamath Falls.

A few days at San Francisco gave an opportunity to see the Exposition and to accompany members of the Geological Society of America on an excursion to the San Andreas rift, movement along which caused the California earthquake of 1906. A week was spent in the Yosemite Valley and the Big Trees region, with special attention to the theories as to the origin of the Yosemite. It was generally agreed that none of them accounts for all the observed phenomena so well as that of profound glacial overdeepening of a preexisting river valley.

Mr. J. S. Diller of the U. S. Geological Survey joined the party on the trip to the summit of Lassen Peak and discussed the effects of the late extrusion of viscous lava and the great mud flow which for many miles inundated a valley on the eastern side of the mountain. Another day was spent at Cinder Cone, the symmetrical little volcano which has recently been active and whose lava flow dammed up a neighboring valley to form a lake of more than ordinary interest.

In the Salt Lake region Professors E. S. Hinckley and F. Buss made it possible for the party to study the mines at Bingham Canyon, the old terraces of Lake Bonneville, the Wasatch Mountains, and the recent faulting in the alluvium and moraines. Mayor Fell of Ogden provided autos for a trip along the base of the mountains and through Ogden Canyon. The Ogden water supply was of especial interest. Artesian wells east of the Wasatch liberate the water content of loose gravels which dip down from the adjacent mountain slopes beneath the compact lake beds of an old estuary of Lake Bonneville, the water then being piped through the canyon to the west side of the range for use in the city. At Provo a visit was made, under the guidance of Professor Buss, to the Provo delta and the series of small *grabens* formed by recent faulting in the alluvium along the mountain base. A few weeks before the arrival of the party an earthquake, presumably due to displacement along this line, caused some alarm.

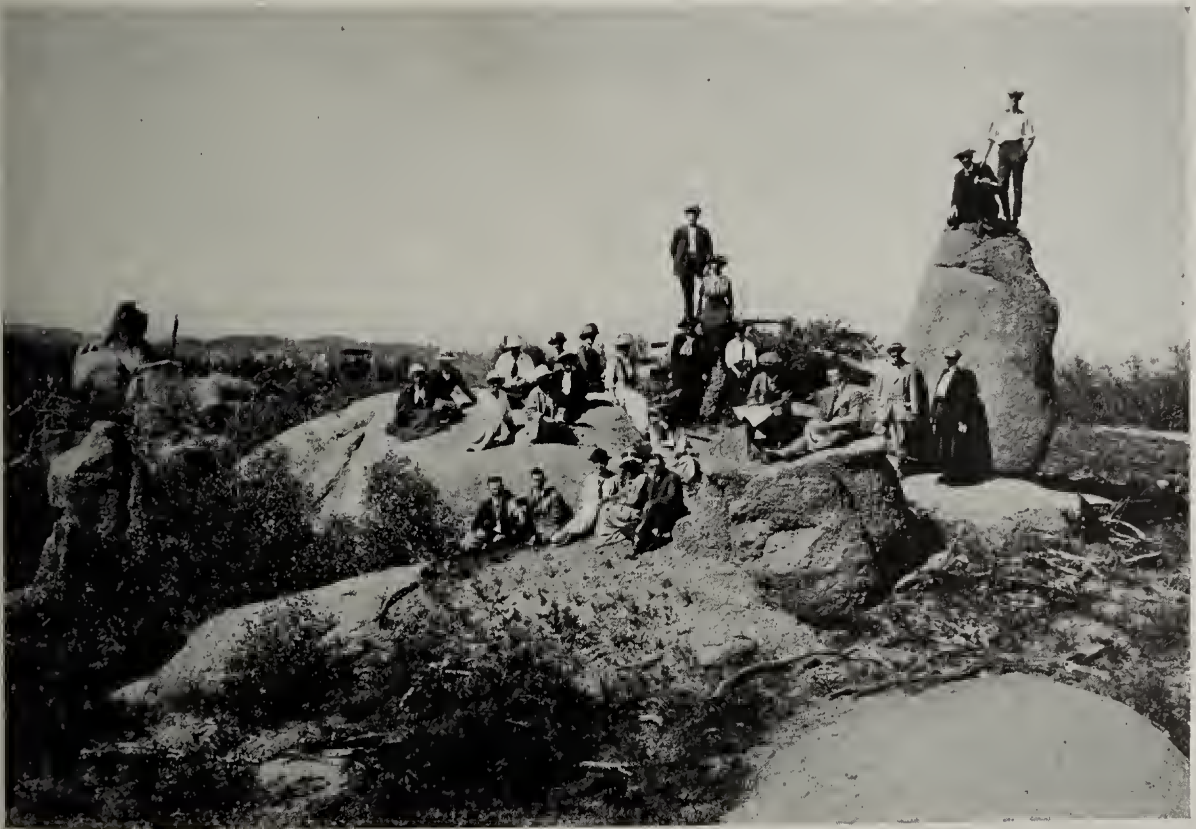

FIG. 1—Weathered granite on the surface of the Rocky Mountain peneplain west of Palmer Lake, Colorado; and members of the physiographic excursion.

In Colorado, there was a twelve-mile tramp through the Royal Gorge, an auto trip over the Sky Line Drive and to the upper rim of the gorge west of Canyon City, another trip from Canyon City along the base of the Front Range to Colorado Springs, the ascent of Pike's Peak, and a drive through the Garden of the Gods. A profitable day's trip from Golden to Morrison Park, led by Professor Victor Ziegler of the Colorado School of Mines, marked the last day of the two months spent in studying the origin of land forms. At Denver the party separated, some going east, and the others continuing their studies in the Grand Canyon, the Petrified Forest, and the Painted Desert of Arizona.

Annual Report of the U. S. Geological Survey. From the point of view of national defense as well as general education the topographic mapping of the United States is proceeding at an alarmingly slow rate. The appropriations for this work should be doubled at least. Maps covering 40,000 square miles are less showy than a battleship but they may be of much greater importance in time of war. The Thirty-Sixth Annual Report of the Director of the U. S. Geological Survey, for the fiscal year ended June 30, 1915, shows that the topographic survey of the United States now covers but 40.2 per cent of the country's vast area. The total area mapped to June 30, 1915, was 1,218,290 square miles; and the area mapped in the past fiscal year was 20,508 square miles. The topographic maps have been completed for Connecticut, the District of Columbia, Maryland, Massachusetts, New Jersey, Rhode Island, and Washington. Only 11 per cent of the area of New York and 3 per cent of Ohio remain to be mapped.

Some of the more important features of the report are outlined in the following paragraphs.

The Search for Potash. In the search for potash no clue has been neglected. A deep well was drilled in 1914 near the center of the Black Rock Desert, in western Humboldt County, Nevada, and, on November 16, was completed to a depth of 1,500 feet. No bed of potash or other salts, in massive form, was encountered in this well, but the test is not considered conclusive as to the hypothesis that buried saline deposits remain in some of these basins as the result of the drying up of the lakes of Nevada, eastern California, and southern Oregon in Quaternary time. The field to be explored is large, and both funds and facilities for exploration have limited the trials to a few localities. The hypothesis on which this exploration is based deserves further test in the hope that potash-rich salt muds or brines, similar to or more concentrated than those found at Searles Lake, California, may be found in other places.

The geological formations which, from the evidence, seem most likely to contain buried potash salts in commercial amounts are the Quaternary lake beds in the Great Basin region of the West and the Permo-Triassic red beds of the Rocky Mountain states, Kansas, Oklahoma, and Texas. The results of exploratory boring in Searles Lake and the thinly covered salt beds in Death Valley, California, establish a degree of validity for the Quaternary lake basin hypothesis and encourage testing in other basins. Hope for the discovery of potash deposits in the red beds of the Southwest is encouraged by the detection of slight potash indications in the west-central region and in the Panhandle of Texas. It is hoped that drillers for oil and water, in the red-bed region and also in the salt-bearing regions of the Salina and other formations in the eastern states, may take advantage of the co-operation of the Geological Survey in the examination of their drill records and cuttings, so that the possible presence of potash deposits of value in any of these regions may be recognized.

Coal and Oil Fields. The coal resources of the many fields are to be differentiated and, with additional and more precise data than have hitherto been available, will be recalculated quantitatively. Looking forward to the time when the oil and gas resources of the United States will have become depleted, the Geological Survey is giving some attention to the carbonaceous shales of the United States and their capacity to yield petroleum, gas, and other valuable distillates.

Various chapters describe the coal fields of Missouri, the Judith River coal field in Chouteau and Fergus counties, Montana, embracing 600 square miles, the subbituminous coal and the lignite regions of eastern Montana, the geology and coal resources of northern Teton County and the Pine Hills region, Montana.

Study of Placer Deposits. The most important of the new co-operative projects undertaken by the Survey and the Bureau of Mines is that for the study of the placer deposits of the United States. Preliminary work, initiated by the Geological Survey, will determine the character, geological occurrence, and origin of the deposits. The Bureau of Mines will study methods and costs of placer mining. It is expected that the field work will extend over two or more field seasons.

The Canal Zone and Antillean Region. The investigations to determine the geological formations, their correlation, and the geological history of the Canal Zone and adjacent regions of Panama and Costa Rica have continued, and most of the reports are approaching completion. The series of reports, which will contain important conclusions as to geological correlation and geological history, will be published by the Smithsonian Institution. Reports similar to those on the Canal Zone are in preparation for the Lesser Antilles.

Alaska. Ten parties were engaged in surveys and investigations in Alaska. About 1,000 square miles were covered by exploratory geological surveys (scale, 1:500,000); 7,700 square miles by reconnaissance geological surveys (1:250,000); and 325 square miles by detailed geological surveys (1:62,500).

Land Classification Board. The work of this board is to receive such results of field investigations as are adaptable to public land classification and to turn these results into actual classifications which become the basis, in the Department of the Interior, of such administration of the public land laws as depend on the character of the lands. Here is a summary of the more important results of the Land Classification Board in the past fiscal year:

In the states under the jurisdiction of the board no coal lands were withdrawn from entry, but 2,363,646 acres were restored to entry, leaving the withdrawn area 48,244,274 acres. At the end of the year 19,489,771 acres had been valued at an average price of $40.60 an acre. About half of the restored land was in Montana and a third in Oregon and Utah; 197,073 acres of oil land were withdrawn from entry and 180,818 acres of non-oil land eliminated from withdrawals, leaving the net area included in oil withdrawals 4,774,418 acres. The phosphate classifications resulted in a withdrawal of 273,221 acres and a restoration of 454,894 acres, leaving the net area of withdrawals 2,660,376 acres. On the basis of containing metalliferous minerals 970,210 acres, chiefly in Indian reservations, were classified, 929,916 acres as non-mineral and 37,294 acres as mineral land; 17,485,259 acres were classified as non-irrigable, the total area thus designated amounting to 235,596,180 acres.

The total area withdrawn on June 30, 1915, was 58,494,844 acres. Of this total all the lands included in coal, oil, phosphate, and potash reserves, aggregating 56,021,081 acres, may now be entered under the non-mineral land laws, the remaining withdrawals of miscellaneous types, aggregating 2,473,763 acres, being not yet subject to agricultural entry. This has greatly reduced the interference of the withdrawal policy with agricultural development.

The American Merchant Marine. The Port of Boston has published a bulletin entitled "The Use and Benefits to Massachusetts Manufacturers and Wage Earners of an American Merchant Marine." The terse statement contains some striking figures. Federal efforts to promote a merchant marine helped to raise the tonnage of American vessels engaged in foreign trade from 984,608 in 1810 to 2,535,206 in 1855. Decline commenced with the dissensions of the Civil War and has continued until at present (1914) the tonnage amounts only to 1,076,152. Figures of the carrying trade between the United States and Germany are significant. In 1914, whilst ninety per cent of German exports to the United States were carried in German ships, only one-fifth of one per cent of United States exports to Germany were carried in American ships.

Twelve Hundred Miles of Navigation on the Kuskokwim River, Alaska. The field work connected with the charting of the approach and entrance to the Kuskokwim River (*Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 205 and 954) was completed in 1915 by the steamer *Yukon*. A press bulletin of the Coast and Geodetic Survey says that a reconnaissance survey was made inland from Bethel, the head of deep-sea navigation, for 550 miles to McGrath, the main settlement on the upper river, from where, on a clear day, Mount McKinley can be seen 150 miles eastward. A river steamer may ascend beyond McGrath for 200 miles. The river, with its tributaries, offers 1,200 miles of navigable waters. The *Quickstep*, the only steamer on the river, draws four and one-half feet and can push a 300-ton barge up stream. She averages two trips from Bethel to McGrath during the open season, from May 15 to October 15. She figured, last summer, in the first good determination of positions along the river's course. Some previous positions were found to be fifty miles in error, and a new map of the river is urgently needed. For the lower 100 miles the Kuskokwim winds through the low lake country; for the next 200 miles it cuts through mountains where the rapids have a six to eight mile current and the banks, in places, rise over 1,000 feet directly from the water. The upper river flows through an immense basin, over which are scattered solitary peaks with a ring of distant mountains on the horizon. The prospector and homesteader have already visited the valley and will perhaps repeat there the story of the Yukon and the Tanana. Three creeks, Candle, Bear, and Cañon, give promise of profitable hydraulic development, rich cinnabar claims having been staked upon the river banks. Vast areas for reindeer are available, and the Irish potato grown there is not surpassed anywhere.

Canadian Fisheries, 1914-15. The decline in value of the Canadian fisheries for the year 1914-15 is mainly accounted for by the returns from British Columbia (*48th Ann. Rept. Fisheries Branch, Dept. of the Naval Service,* Ottawa, 1915). The year is a lean one in the four-year cycle salmon run on the Fraser. Nova Scotia lobster and mackerel fisheries were affected unfavorably by the war, but other provinces showed an increase: Albertan fisheries, in fact, were indirectly encouraged by the same cause. Decline of the European fur markets induced many trappers to transfer their energies to fishing as a source of livelihood. Apart from this circumstance the northern part of Alberta is making progress in the industry and will do so on a greater scale with the improvement of transportation facilities.

Irrigation in Alberta. The Canadian government presents the results of a recent investigation into the suitability of the Calgary region for irrigated farming (Report on the Climatic and Soil Conditions in the Canadian Pacific Railway Company's Irrigation Project, Western Section, *Irrigation Series Bull. No. 3,* Dept. of the Interior Ottawa, 1915). After a comparison of climatic and soil conditions with those of simila regions where irrigation has been successfully conducted, the report claims that irrigation is certainly desirable and probably necessary for satisfactory agriculture at Calgary In the length of the growing season the region compares favorably with the San Lui Valley, Colorado (7,500 feet altitude), where mixed farming, based on irrigation, ha been practiced for over forty years. Local frosts appear to be less severe, and in th mean temperature of the growing period, Gleichen, which may be taken as representative of the Calgary region, is only 1° lower than San Luis. The average time for th maturing of irrigated wheat is stated to be 126 days, a few days longer than for th unirrigated crop. With the first killing frost on September 4, crops are quite safe during ordinary years. Moreover the heat-conserving properties of moisture enable th irrigated grain to more easily withstand early frosts. A further advantage gained b irrigation is the increase in yield—56 per cent for wheat. Whilst the average rainfal of the last decade or so has been sufficient in total amount (Gleichen averages 14. inches for the last twelve years), it must be borne in mind that the distribution durin the growing season is the vital factor and that the climate has the characteristics o semi-aridity—variable periods of drought and unutilizable rains. Calgary records, whic go back further than those of Gleichen, show an average of only 7.4 inches for the year 1885-1896, a deficiency making irrigation absolutely necessary. The soil of the sectio is said to be rich and, where proper drainage is instituted, does not become excessivel alkaline under irrigation.

Origin of the Name Manitoba. A recent number of the *Bulletin de la Société d Géographie de Québec* (Vol. 9, 1915, No. 5, pp. 310-311) throws light on the derivatio of this name. Although various explanations have been put forward from time to time the consensus of opinion points to the Assiniboin words *mine* and *toba,* meaning respectively "water" and "prairie." Accordingly "Minetoba" signifies "prairie waters" or "prairie lake." The name of "Lac des Prairies" used by La Vérendrye to designat Lake Manitoba in his writings is a correct rendering of the native form. Nevertheles Minetoba, or rather its common variant Manitoba, has come to stay. It is gratifyin to find that the French version eventually gave way to the native American and tha the first Dominion province created west of the Great Lakes bears a name of loca origin.

Soils of the Rainy River District of Ontario. The Rainy River district occupie some 1,000 square miles between Lake of the Woods and Rainy Lake. While stil largely dependent on forestal resources, soil and climate favor its future agricultura development. At present no more than a third of the land is occupied and under fiv per cent is improved, but this improved area supports a rural population of ninety t the square mile and has produced excellent crops of wheat (W. A. Johnston: Rain River District, Ontario: Surficial Geology and Soils, *Canada Geol. Surv. Mem. 82: Geol Series No. 68,* Ottawa, 1915). Physiographically the region is to be considered as th extreme eastern edge of the Prairie Plains. Relief is slight and the major part of th surface is covered with a deep mantle of glacial material: a lower deposit of till from the invasion of the Labradorian ice and a later one from the Keewatin center, glacio-lacustrine material from an early lake stage, and later and more extensive lacustrine an littoral formations of ancient Lake Agassiz. Though lakes are not common, on accoun of the uniformly aggraded character of the drift, the area is still in the earliest hydrographic stage and is ill-drained and swampy. Of the 755 square miles surveyed nearl one-third is covered with accumulations of muck and peat averaging three feet i thickness. Such surfaces are usually well forested with a characteristic association o cedar, tamarack, and spruce. Twenty-seven per cent is occupied by lacustrine an glacio-lacustrine soils of clay-loam that support poplar and balm of Gilead, with elm and oak on the better-drained portions. A fine sandy loam weathered from the calcareous till comprises about twenty-four per cent and forms the best agricultural land Deciduous trees make a greater showing in this section, still extensively timbered i spite of the numerous fires that have destroyed much of the original growth.

Earthquake in the Imperial Valley, California. One of the severest earthquak shocks since the San Francisco earthquake of 1906 occurred on June 22 in the Imperia Valley, southeast California. At 7:40 P. M. a heavy shock cracked and destroyed buildings and was followed an hour later by another severe shock. Subsequent shocks wer frequent but diminished in intensity, though severe recurrences were reported up t August 19, as appears in the report of Carl H. Beal (The Earthquake in the Imperia

Valley, Cal., June 22, 1915, *Bull. Seismolog. Soc. of Amer.*, Vol. 5, 1915, pp. 130-149). The shock was perceptible over an area of 50,000 square miles.

The Imperial Valley is in the Colorado Desert, and a small part of it extends into the northern part of Lower California, Mexico. Most of the area affected is sparsely settled excepting approximately 250 square miles in the heart of the Imperial Valley. In the surrounding portions of the desert and in the mountains on the west and southwest there are practically no settlers. The Imperial Valley is almost entirely below sea-level in a depression which was filled in recent geological time by a body of water. Irrigated from the Colorado River, this valley has been turned within the past few years into one of the most fruitful areas of truck farming in California.

One fault and probably several others are believed to pass through the valley, but very little geological evidence is available, and most of the conclusions as to the faults are based upon the existence of hot or mud springs on the valley floor and on the character of the topography of the foothills and through the mountains along the west side of the desert.

One of the maps accompanying Mr. Beal's paper gives the location of the more important faults that are shown by field study or are believed from other evidence to exist. From all the facts obtained Mr. Beal says that the disturbance probably originated on the San Jacinto fault, which is believed to be prolonged in the bed rock underneath the Imperial Valley. This fault has been traced from the San Gabriel Mountains to the northwest towards El Centro and nearly to the edge of the desert. It has been shown that it probably exists in the Superstition Mountains, 15 miles northwest of El Centro, and it probably passes through the mud volcanoes on the west side of Volcano Lake, with the settlements of the Imperial Valley to the east and west of it. Mr. Beal says the disturbance was equal in violence to that of the San Francisco earthquake.

SOUTH AMERICA

The Mapping of Brazil. About one per cent of the total area of Brazil has been mapped to date on the scale of 1:100,000, mainly in the state of São Paulo, where 23 quarter-degree sheets have been issued, according to a recent report of the Brazilian Ministry of Roads and Public Works (A. P. da Cunha: Determinação de coordenadas geographicas no Estado do Ceará, *Inspect. de Obras contra as Seccas Publ. No. 27,* Rio de Janeiro, 1914, pp. iv-x). Surveying for maps on the same scale was also undertaken in the states of Minas Geraes and Rio de Janeiro. This work, however, has been temporarily abandoned.

An agreement was reached in 1909 between the Serviço Geologico e Mineralogico do Brasil and the Inspectoria de Obras contra as Seccas whereby surveys of the semi-arid regions of the country were to be made jointly by the two departments. The states affected by this decision are Ceará, Rio Grande do Norte, and Parahyba. The scale of 1:1,000,000 was adopted for this work, and it was decided to issue the maps in conformity with the symbolism determined for the ''Carte Internationale du Monde.'' Altogether 51 sheets will be required on the millionth scale for the surface of Brazil. Some of the geological maps on this scale issued as a result of this agreement accompany publications which are listed under ''Brazil'' in the section on ''Geographical Publications'' in this number.

Dr. Farabee's Work in the Amazon Basin. A letter received by Mr. G. B. Gordon, director of the University Museum, Philadelphia, from Dr. W. C. Farabee, dated October 8, 1915, tells of his journey between the Tapajoz and the Xingú Rivers, where he discovered a large plain of waste desert country and in it found the central villages of the Mundurucu Indians. In this journey, which occupied about four months, astronomical observations were made for latitude and longitude, and several rivers tributary to the Tapajoz and branches of these rivers were mapped for the first time. The chief object of the expedition was, of course, anthropological. Dr. Farabee lived for a considerable time among the Mundurucus, studying their language, their manners and customs, making a vocabulary and writing down much of their folk-lore, as a result of which he expects to settle the long-vexed question of the relation of this tribe to the Tupi. He also visited villages of the Apiacas and Manes and obtained important data.

Further Information on the Rio Ananás Expedition. Lieut. William H. Mardock, U.S.N., under date of December 10, 1915, wrote from Santarem on the lower Amazon to Colonel Theodore Roosevelt supplying further data on the exploration by Lieutenant Marquez de Souza of the Rio Cardosa, a tributary of the Rio Theodoro.

The January *Review* (p. 50) contained a letter from Colonel Roosevelt giving the fir report on De Souza's explorations. Lieutenant Mardock's letter contains a translatio of the report of the survivors as published in a Manáos newspaper. The field work wa conducted by the Commissão de Linhas Telegraphicas Estrategicas de Matto Grosso a Amazonas, the organization of which Colonel Rondon is the chief. Lieutenant De Souz and Senhor Carvalho, the master constructor of the telegraph line, were killed by Indian on May 29, and one other member of the party was badly wounded. The rest escape and, reaching the Rio Aripuana, descended by the launch *Hercules* to the Amazon. It i supposed that the Indians formed part of the Araras tribe.

Colonel Roosevelt has kindly transmitted this information for the use of the Societ It has also been learned that there has recently been an uprising among the Nhambiquaras and that several settlements through which the Roosevelt-Rondon expeditio passed were wiped out.

Lieutenant Mardock reports further that at a conference in Rio de Janeiro on December 5, 1915, it was proposed to give the name Rondonia to the region between th Juruena and Madeira Rivers in honor of Colonel Rondon.

Botanical Expedition to the Desert Regions of Brazil and Argentina. Dr. J N. Rose returned in October from his second South American exploration trip, where h was sent by the Carnegie Institution of Washington. The chief object of his trip wa to study and collect cacti from the great desert regions. From Bahia, Brazil, he visite by rail the semi-arid region of the northern part of the state of Bahia. This dry par of Brazil is in the *caatinga,* or thornbush, region. The desert flora is extremely interesting, possessing many features in common with the West Indies. The cactus flor consists of a number of very curious types, several of which are new. Excursions wer also made over the other two railroads connecting with Bahia, one south which goes a far as Toca da Onça and the other to the southwest which terminates at Machad Portella. From Rio de Janeiro as the next base excursions were made to the top o Itatiaya, the highest mountain peak in Brazil; to the Organ Mountains by way o Petropolis; to the great salt works of Brazil, by way of Cabo Frio; to Isla Grande, a remarkable island lying south of Rio de Janeiro; and also to São Paulo. In this last-named region there has been a remarkable development of epiphytic cacti, of which there are some forty species. Later on, excursions were made in Argentina from Buenos Aires to Mendoza and to Córdoba. From all these places large collections of living and herbarium specimens as well as numerous photographs were obtained.

EUROPE

Kabyle Labor in French Grain Fields. Beneficent colonial policy in North Africa is now bringing France a just reward. Everyone knows of the military achievements of the native Algerians and Tunisians, but few people are aware of their contribution to French agriculture. Scarcity of harvesters in the wheat fields of the Beauce induced the government to import some thousand laborers from the mountain farms of the Kabyle country ("France's Colored Troops," by Stoddard Dewey, *The Nation,* Dec. 16, 1915). Thrifty, industrious, adaptable, the Kabyles have proved their value as a dependable source of labor. Besides the mutual material gain—their work was well worth the dollar a day that to them represented unwonted wealth—the educational and social gain should prove a distinct asset in French colonial progress.

ASIA

Japanese Internal Colonization. The stream of government-supported immigration to the island of Hokkaido in 1914 suffered a set-back attributable to the famine of the previous year. The immigration movement has been largely responsible for the notable increase in population within the last years. In 1908 the population was only some 30 to the square mile (see "Japanese Colonial Methods," by Ellen Churchill Semple, *Bull. Amer. Geogr. Soc.,* Vol. 45, 1913, pp. 255-275); in 1912 it had risen to about 55 to the square mile (Trade of the Consular District of Hakodate, *Dipl. and Cons. Reports,* Annual Series, No. 5478, Nov., 1915). Economically Hokkaido appears to be approaching a position of stability: revenues are sufficient for self-support, though for any extensive scheme of development the island will still be dependent on the central government.

Northern Routes of Commerce Between Europe and Asia. The prolongation of the European war tends to create commercial sea routes between northern European ports and the Arctic harbors of Siberia. *Commerce Reports,* published by the U. S. Department of Commerce (No. 291, Dec. 13, 1915, p. 1021), record an instance of a recent ccessful cruise by the steamers *Haugastoel* and *Eden*, respectively of 3,100 and 2,000 ns. Both ships belong to the Siberian Steamship Manufacturing and Trading Co., Ltd., d were fitted out at Tromsö with mixed cargoes for the Ob and Yenisei Rivers. On the turn trip they carried Siberian products, such as butter, hemp, flax, etc., to Grimsby, ngland. It took nineteen days for the *Haugastoel* to reach Tromsö. The *Eden* made the ip in five more days. Plans have been laid for sending a large fleet during the mild-eather months of 1916, and it is expected that surplus stocks of grain, hides, flax, and nseed from central Siberian districts will be available for European consumption through ese routes.

Difficulties of transportation account largely for the backward condition of Siberia. he absence of railroads or the high cost of operation in the few districts they traverse verts traffic toward the rivers. But the fact that they flow northward into a region of tremely rigorous winters robs them of much of their value as trade channels. The most rious drawbacks to river navigation exist at the outlets rather than upstream. Shifting ndbars and ice-floes are the dangers which lie respectively in the path of river steamers of ocean craft. When these obstacles are overcome, there will probably be an increase the exchange of European manufactured goods for the central Siberian products of ain, hides, and lumber. Nansen's ''Through Siberia, the Land of the Future'' con-ins excellent descriptions of the various regions of Siberia and their products.

AUSTRALASIA AND OCEANIA

Annexation of the Gilbert and Ellice Islands. The *London Gazette* of November 2 announced the annexation of the islands of the Gilbert and Ellice groups in the Pacific cean. In 1892, they had been proclaimed as a protectorate of Great Britain. The native overnments having recently expressed their desire that the islands be annexed, they will enceforth form part of His Majesty's dominions and will be known as the Gilbert and llice Islands Colony. The Gilbert group lies between 170° and 180° E. and is bisected y the equator; the Ellice Group lies between 5° and 11° S. and in about 178° E. The opulation of the islands composing the colony was estimated (1911) at 26,417 natives d 446 foreigners. The largest island of the Ellice group is Funafuti, where, some ghteen years ago, a boring was carried down to a depth of 11,014 feet, proving the xistence of a mass of pure limestone to that depth without trace of any other rock. This sult was regarded as favorable to Darwin's theory of the origin of coral reefs.

POLAR REGIONS

The Coal Mines of Spitzbergen. The existence of coal in Spitzbergen has been nown for a long time, but it may not be so well known that the coal mining development ere is chiefly the work of a Boston company which seven or eight years ago acquired tle to the coal mines in Advent Bay, Ice Fiord, on the west side of Spitzbergen, and, conjunction with a Norwegian company, to the coal region of Green Harbor. The al is of excellent quality, is sent to Norway and also to Archangel, Russia, which is a rowing market for this coal. The miners in Advent Bay, at first thirty or forty, now mber 350, mostly Norwegians. They have been encouraged to bring their families with em, are lodged in comfortable houses, and are supplied with everything they need at asonable prices. The Advent Bay mine is on the flank of a mountain about 1,200 feet ove sea-level and produces about one thousand tons of coal a day. Owing to the ice nditions, the coal can be shipped to Europe as a rule only between July 1 and Septem-r 2.

Fate of the Crocker Land Expedition. The *George B. Cluett,* the ship sent to ing home the members of the Crocker Land Expedition *(Bull. Amer. Geogr. Soc.,* Vol. 7, 1915, pp. 452 and 535) has had the misfortune of being held fast in the ice, unable to each her goal or to return. The ship, which left New York on June 9 with Captain eorge Comer in command and Dr. E. O. Hovey on board, was expected to be back in eptember or October. Instead she was still 125 miles from Etah, the expedition's eadquarters, on September 12, on which date she arrived at North Star Bay in Wosten-olme Sound on the west coast of Greenland in 76½° N., after being delayed for irty-five days in Melville Bay by ice and trouble with the motor. Because of the tumn ice, she did not dare proceed to Etah. A motor boat of the Danish mission was, owever, to call for the members of the expedition and bring them to North Star Bay. the meantime, however, the *George B. Cluett* has undoubtedly been forced to spend e winter there. No anxiety need be felt, however, for the safety of either the main pedition or the relief expedition as the ship was provisioned for fourteen months.

This news about the expedition was received by the American Museum of Natural History in a cablegram from Knud Rasmussen, the Danish explorer, who has helped in every way possible. In a supplementary letter he says that the information was received through the Danish vessel *Kap York* which had reached Holstenberg in southern Greenland on October 19 and there transferred her mail to the regular mail steamer, which brought them to Copenhagen. Later, on the arrival of the *Kap York* Herr Rasmussen hoped to receive further details.

Letters received by the same channel from Donald B. MacMillan, the leader of the Crocker Land Expedition, and W. Elmer Ekblaw, geologist and botanist, dated respectively April 6 and March 20, 1915, told of a trip for which Ekblaw had prepared, on which he proposed to study the geology and zoology of the western coast and the northern part of Ellesmere Island. The route as planned was as follows: from Etah across Smith Sound to the head of Beitstad Fiord (Flagler Bay), across the island to the head of Bay Fiord, north along the coast to Greely Fiord, with a possible side trip to the head of Canyon Fiord, up Greely Fiord and back across the island via Fletcher Lake and Lake Hazen to Fort Conger, on Hall Basin, and from here back to Etah via Kennedy Channel and Kane Basin. This itinerary covers a distance of 1,130 miles. Ekblaw left at the end of March and hoped to be back early in July at the latest.

OCEANS

New Magnetic Surveys by the "Carnegie." The magnetic survey vessel, the *Carnegie,* at present under the command of J. P. Ault of the Department of Terrestrial Magnetism of the Carnegie Institution, arrived at Port Lyttelton, New Zealand, on November 3, after a successful continuous trip of ninety days from Dutch Harbor, Alaska. Leaving Port Lyttelton on December 5, the *Carnegie* is now engaged on the accomplishment of the circumnavigation of the region between the parallels of 50° and 60° S., where almost no magnetic data have been secured during the past seventy-five years.

HUMAN GEOGRAPHY

Methods of Frost Fighting. Frost is most frequently associated with the phenomenon of inversion of temperature. It occurs on clear, dry nights when the air loses an abnormal amount of heat by radiation and when absence of horizontal movement in the atmosphere permits the accumulation of a stratum of cold, dry air near the surface of the ground. Frost, then, may be prevented by conservation of the heat of the earth, and the farmer's problem lies in determining the best method of accomplishing this result. The oldest method retains the heat by the application of some covering—straw, sheeting, the moistened dense smoke called smudge, etc. (Alexander McAdie: The Theory and Practice of Frost Fighting, *The Scientific Monthly,* December, 1915.) The principle is quite common in many forms of primitive industry. The Peruvian Indian has employed it, empirically of course, from time immemorial in his custom of burning the pastures of the sierra at the beginning of winter—June to September—the period of maximum cold and drought. The burning produces a layer of carbon, an excellent blanket for the conservation of heat. In marked contrast to this primitive method is the employment of artificial heat in the highly specialized fruit industry of California. Wood, straw, and coal have been used, gas and electricity are proposed, while at present crude oil is the chief source of heat. The high specific heat of water and water-vapor mark them out as valuable heat-retainers: flooding and the formation of light fog sheets may be advantageously used with certain crops, for instance the cranberry. Water likewise prevents the damage to plant tissue arising from too rapid thawing from a frozen state and elsewhere is useful in retarding development until the critical season is over. A possible fourth method, the mixing of the higher and warmer layers of the atmosphere with the lower and colder strata, still remains no more than an academic possibility.

GEOGRAPHICAL NEWS

Geography at the University of Chicago. In the Department of Geography of the University of Chicago there were 220 registrations during the autumn quarter, and nearly as many during the summer quarter. Since some students register for more than one course, the total number of students was somewhat less than the total number of registrations. During the academic year which closed last June, the total number of registrations in the department was 831, a larger number than in the Department of Zoology or of Botany. The Department of Geography has created wide interest in its work, and its influence is steadily increasing.

Presentation of a Geographical Library to the University of California. The rench government has presented to the University of California the collection of some ix thousand volumes representing France's contribution to civilization which formed a otable feature of the French exhibit at the Panama-Pacific International Exposition. The volumes on geography were selected by Emmanuel de Martonne; those on geology y Emmanuel de Margerie.

PERSONAL

PROFESSOR GEORGE H. BARTON, Director of the Teachers' School of Science, Boston, as been giving a course of lectures on ''Mountains: Their Classification, Origin, Growth, Structure, and Decay'' before the Appalachian Mountain Club of Boston. The subject f the fourth lecture, on November 17, was ''Origin of Relict Mountains.''

MR. H. O. BECKIT has, on the death of Professor Herbertson, been appointed acting irector of the School of Geography at the University of Oxford. Mr. Beckit, it will be emembered, was a member of the Society's Transcontinental Excursion of 1912.

DR. FRANK M. CHAPMAN spoke on ''The Origin of Zonal Faunas in the Andes'' before he New York Academy of Sciences on December 13.

PROFESSOR W. M. DAVIS spoke on the ''Glacial Sculpture of the Mission Range of Montana'' at the public scientific sessions of the autumn meeting of the National Academy of Sciences on November 16 and 17. Other papers of geographical interest were 'Recent Explorations in the Cactus Deserts of South America'' by J. N. Rose (see also tem on ''Botanical Expedition to the Desert Regions of Brazil and Argentina'' in this umber on p. 144) and ''Concomitant Changes in the Earth's Magnetism and Solar Radiation'' by L. A. Bauer.

MAJOR-GENERAL WILLIAM C. GORGAS, Surgeon General of the United States Army, was presented with the gold medal of the Geographic Society of Chicago at its annual inner on January 8. After the presentation Major-General Gorgas delivered an address ntitled ''Sanitation in Its Relation to Geography.''

MR. FRANCIS HARPER, of the Brooklyn Institute Museum, gave an illustrated lecture on November 23 before the Linnaean Society of New York entitled ''Observations on the Wood Buffalo in the Northwest.''

PROFESSOR D. W. JOHNSON, of Columbia University, at the recent Columbus, Ohio, meeting of the American Association for the Advancement of Science, gave the annual evening address to which the general public is invited. His subject was ''Surface Features of Europe as a Factor in the War.''

MR. A. K. LOBECK, a graduate student in geology at Columbia University, spoke on ''The Position of the New England Peneplain in the White Mountain Region'' before the New York Academy of Sciences on December 6.

DR. ROBERT H. LOWIE and DR. PLINY E. GODDARD gave a course of four lectures on ''The Varieties of Culture Among North American Indians'' at the American Museum of Natural History during January. The subjects of the individual lectures were as follows: Statement of the Problems; The Indians of the East, January 6; The Indians of the Plains, January 13; The Indians of the Southwest, January 20; The Indians of the Pacific Coast; Résumé, January 27. The first two lectures were given by Doctor Lowie, the other two by Doctor Goddard.

DR. FRITZ MACHATSCHEK, assistant professor of geography at the University of Vienna, and, four years ago, a member of the Society's Transcontinental Excursion, has been appointed to the professorship of geography at the German University of Prague to succeed Professor Alfred Grund, who was killed in action early in the war.

PROFESSOR C. F. MARVIN, Chief of the U. S. Weather Bureau, spoke on ''The Work of the Weather Bureau'' at the Ohio Academy of Science meeting in November.

MR. A. G. OGILVIE, junior demonstrator in geography at the University of Oxford and a member of the Society's Transcontinental Excursion of 1912, volunteered for service at the front early in the war. At last report he was attached to the Mediterranean expeditionary force in a geographical capacity.

DR. WALTHER PENCK, son of Professor Albrecht Penck and recently instructor of geology at the University of Leipzig, has been appointed professor of geology, and Dr. Erich Obst, of the University of Marburg, professor of geography, at the recently reorganized University of Constantinople.

Dr. Joseph E. Pogue, associate professor of geology and mineralogy at Northwestern University, gave an illustrated lecture on December 10 before the Geographic Society of Chicago entitled, ''Through the Heart of Colombia.''

OBITUARY

Dr. Orville A. Derby died suddenly in Rio de Janeiro on November 27, aged 64. Since 1907 he had been director of the Geological Survey of Brazil. A pupil of Professor C. F. Hartt, of Cornell University, whose well-known ''Geology and Physical Geography of Brazil'' was published in 1870, he followed in his teacher's footsteps and went to Brazil. From 1875 to 1878 he was assistant geologist on the Geological Survey of Brazil and from 1886 to 1904 he was director of the Geographical and Geological Survey of the state of São Paulo. In 1906 he co-operated with Professor J. C. Branner of Leland Stanford University in producing a useful elementary manual of geology adapted to Brazilian students.

Professor Edward Van Dyke Robinson died suddenly on December 10 in New York at the age of 48. Professor Robinson had just taken up his new duties at Columbia University, and his death is a great loss to the cause of geography in the United States. Professor Robinson's contributions to geography were mainly on the economic side. From 1907 to 1915 he had been professor of economics at the University of Minnesota. His textbook ''Commercial Geography,'' 1909, is widely used, and his recent ''Early Economic Conditions and the Development of Agriculture in Minnesota'' is a noteworthy contribution to the subject.

Mr. William J. Sutherland, president of the Platteville (Wis.) Normal School, died suddenly on December 9. Mr. Sutherland is best known through his ''The Teaching of Geography,'' 1909. With C. M. Sanford he had recently written ''Practical Exercises in Geography: Book 1, Our Own Country and Her Possessions.'' For six years he had been head of the department of geography and geology in the Macomb (Ill.) Normal School. He was born in Cherry Valley, Ill., April 14, 1865.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the January number, pp. 57-61

NORTH AMERICA

General

Rice, W. N., F. D. Adams, A. P. Coleman, C. D. Walcott, Waldemar Lindgren, F. L. Ransome, W. D. Matthew. **Problems of American Geology: A Series of Lectures Dealing with Some of the Problems of the Canadian Shield and of the Cordilleras, Delivered at Yale University on the Silliman Foundation in December, 1913.** (Dana Commemorative Lectures.) xvii and 505 pp. Maps, ills, index. Yale Univ. Press, New Haven, 1915. $4. 9½ x 6½.

In this handsomely illustrated volume there has now been printed the series of lectures by the seven geologists of the United States and Canada who were invited to commemorate the work of the late Professor Dana at Yale. Two subjects in which Dana was particularly interested, the pre-Cambrian shield and the western Cordilleras, were chosen for treatment.

"The Geology of James Dwight Dana," by William North Rice, reviews the work of Professor Dana in mineralogy, zoology, and evolution, as the author of standard text-books, as a field geologist particularly in New England, and as a geological philosopher of the first rank.

"Problems of the Canadian Shield—The Archæozoic," by Frank Dawson Adams, outlines some of the partly solved problems of the Canadian shield, such as the true stratigraphy of the older pre-Cambrian rocks, the correlation of isolated sections, and the nature of the base upon which the pre-Cambrian formations rest. The facts are drawn chiefly from eastern Ontario and Quebec, with some reference to Lawson's district in Manitoba. The author's views on some of these matters are at variance with those of the majority of students of the pre-Cambrian, and his lecture therefore partakes of the character of a minority report. It is unfortunate that the larger group was not represented.

"The Proterozoic of the Canadian Shield and Its Problems," by Arthur P. Coleman, deals chiefly with the region north of Lakes Huron and Superior, but for that area it brings together in small compass the results of the many investigations of the Proterozoic rocks that have been pursued in recent years. A new classification of the younger pre-Cambrian formations is proposed, which differs radically from the decision of the International Committee of 1905. Formations in the various districts are described, their historical significance interpreted, and the author's views on their correlation set forth. The interpretation of the conditions of deposition is imaginative rather than critical.

"The Cambrian and Its Problems in the Cordilleran Region," by Charles D. Walcott.—Doctor Walcott has been identified with the subject for thirty years or more. His paper, necessarily, is largely a report of his own explorations and the conclusions he has drawn from them regarding the geography of Cambrian time, the origin of its sediments, the nature of its faunas, and their significance in the correlation of the rocks of scattered districts.

"The Igneous Geology of the Cordilleras and Its Problems," by Waldemar Lindgren.—Certain periods are believed to have been signalized by eruptions of distinctive magmas that emanated from separate basins or reservoirs. Some of these igneous eras are very long and overlap others in chronology. The author favors the view that the various unlike magmas are stratified beneath the crust of the earth,—the basic layer being below, and the acidic above, with intergradations.

In "The Tertiary Orogeny of the North American Cordillera and Its Problems," by Frederick L. Ransome, the conclusions of many field students are reviewed to show how far the problems of the region have been solved and how much still remains to be elaborated and established. The author advances no cherished theories of his own, but his analysis of the voluminous and complex store of observed facts is full of valuable criticism.

"The Tertiary Sedimentary Record and Its Problems," by William Diller Matthew, discusses the origin of the Tertiary sediments of the West, their time relations, and their life record. Like the other lectures in the series, it constitutes a summary of recent progress as well as a display of problems about to be attacked. Eliot Blackwelder.

Frankenfield, H. C. **The Tropical Storm of August 10, 1915.** Maps, diagrs., ills. *Monthly Weather Rev.*, Vol. 43, 1915, No. 8, pp. 405-412.

Howard, L. O., H. C. Dyar, and Frederick Knab. **The Mosquitoes of North and Central America and the West Indies: Systematic Description** (in two parts). 523 pp. Diagr., bibliogr. *Carnegie Institution Publ. No. 159.* Washington, D. C., 1915. 10 x 6½. [The complete work will comprise three volumes, issued in four parts.]

Earthquake of February 10, 1914 [in eastern Canada and the United States]. [1:2,217,600]. Accompanies "Earthquake of February 10, 1914" by Otto Klotz, *Publs. Dom. Observ.*, Vol., 3, No. 1. Ottawa, 1915. [The epicenter lay 75 miles northwest of Montreal; the maximum extent of perceptible tremors is indicated by the following localities: Saguenay River, New York, St. Thomas, Ont.].

Alaska

Moffit, F. H. **The Broad Pass Region, Alaska. With Sections on Quaternary Deposits, Igneous Rocks, and Glaciation** by Joseph E. Pogue. Maps, ills., index. 80 pp. *U. S. Geol. Surv. Bull. 608.* Washington, 1915.

A noteworthy report on a large and remote region about the head of a valley whic has been chosen as the route of the proposed and much-discussed government railroad The valley was first traversed in the direction of the interior in 1897; a preliminar survey was made in 1902 and the final survey in 1913. The railroad is to run from Sewar 310 miles north to Broad Pass and thence 150 miles farther north to Fairbanks (see ma in *Bull. Amer. Geogr. Soc.*, Dec., 1915, p. 923).

There are eight splendid panoramic photographs and a good topographic map. Amon the other valuable features of the report is a map showing the distribution of spruc timber in the Broad Pass region. The elevation of the timber-line varies between 2,50 and 3,000 feet. Willows large enough for firewood and tent poles grow on the valle floors up to 3,200 feet. Spruce is the only valuable timber. Grass grows luxuriantly i many small valleys near timber line and is a valuable asset for both the prospector an the grazing interests of Alaska. "It is a custom of the miners on Valdez Creek to tur their horses loose when the freighting is finished and the summer's wood supply is gathere and to provide them with forage as long as they will return to the camps for it."

There is practically no population at present. Some of the miners take in extra sup plies of groceries, tobacco, and ammunition to trade with the Indians in Valdez Creek wh formerly lived on Tyon River and made yearly trading expeditions to Cook Inlet. "A present the natives stay in their cabins on Valdez Creek until early July and then leav for the hunting grounds to spend the summer and kill game for the winter. They start ou with a small canvas for shelter and a few supplies like tea and sugar to supplement th diet of meat, fish, and berries that will constitute their chief food supply until the return."

One of the most important factors in the development of so remote a region is tran portation. Under present conditions ordinary supplies can probably be freighted to Broa Pass from Fairbanks more easily and cheaply than from any other point. Even now som of the miners on Valdez Creek bring supplies from Fairbanks, hauling them over the i of the Nenana River. The winter route from Cook Inlet, however, should be fully a good, although the use of this route would necessitate landing freight at the head c Cook Inlet before winter sets in.

Construction work on the government road has been begun, and doubtless the Broa Pass region soon will be one of the parts of interior Alaska most easily reached.

Capps, S. R. **The Willow Creek District, Alaska.** 86 pp. Maps, diagrs., ill index. *U. S. Geol. Surv. Bull. 607.* Washington, 1915.

Capps, S. R. **Two Glacial Stages in Alaska.** Diagr., ills. *Journ. of Geol.*, V 23, 1915, No. 8, pp. 748-756.

Capps, S. R., and B. L. Johnson. **The Ellamar District, Alaska.** 125 pp. Ma diagrs., ills., index. *U. S. Geol. Surv. Bull. 605.* Washington, 1915.

Smith, P. S. **Notes on the Geology of Gravina Island, Alaska.** Maps, ill *U. S. Geol. Surv. Prof. Paper 95-H*, pp. 97-105. Washington, 1915.

Canada

General

Ami, H. M. **North America. Vol. I: Canada and Newfoundland.** (Series: Sta ford's Compendium of Geography and Travel, New Issue.) 2nd edit., revise xxviii and 1069 pp. Maps, ills., index. Edward Stanford, Ltd., London, 1915. 1 7½ x 5½.

Dr. S. E. Dawson's book under this title in the Stanford series was in great need revision, first, because its statistics had become so old as to be quite useless and, second, because the author did not have the point of view of modern geography. At the time of publication it was a praiseworthy piece of work, useful to college classes and to the general reader alike. But the Dominion has grown marvelously since that time—for that matter it is still hardly past the threshold of its political and economic career.

Doctor Ami's work in the main exhibits no less of thoroughness than Dawson's. The sections on Indian life have gained to a notable degree by the introduction of passages on distribution, relation with the whites, and present condition. The sections on forests are equally attractive. The northwestern provinces are quite adequately treated, and there is a happy display of recent maps—of coal areas, railways, belts of forest, mean annual rainfall, drainage basins, the international boundary at Lake of the Woods, and part of the western Cordillera.

These excellent special qualities and many others shared by the other books of this series recommend ''Canada and Newfoundland'' to both the general reader and the scholar who wish all the important information of guide book and reference book combined.

On the other hand, if we read with an eye to the principles of modern geography there are a number of serious faults. As much attention is paid to the geology of a province (with full use of technical terms) as if the reader were a professional geologist. Yet the physiography is for the most part empirically described; and production and commerce, activities and distribution of people, the reaction between man and the plant world, are all treated from the standpoint of mere information and almost without reference to the principles of anthropogeography. Modern Canada! what a theme for the geographer to unfold! Alas, that it has yet to be done.

Herein apparently lies the explanation for some important omissions. Stefansson's book ''My Life with the Eskimo'' is unquestionably the best *geographic* work on a large part of the Arctic coast of Canada. It is not included in Ami's quite extensive bibliography. Two references to Stefansson relate, the one that he led an expedition to the Arctic, the other that the expedition ended disastrously in January, 1914! A. W. G. Wilson's paper on The Laurentian Peneplain (1903), a philosophic piece of work with much excellent geography, is not mentioned. These are major omissions from a list of truly geographic papers so short we would suppose no one could be omitted. Fernald's views on the Norsemen are apparently unknown to the author, though he discusses at length the Norse voyages. The botanical evidence so ably assembled by Fernald is vital, forms a line of argument wholly independent of the others, and seems indispensable in the solution of the problem.

Ontario, Quebec

Bancroft, J. A. **Report on the Copper Deposits of the Eastern Townships of the Province of Quebec.** 295 pp. Map, diagrs., ills., index, bibliogr. Dept. of Colonization, Mines and Fisheries, Quebec, 1915.

Malcolm, Wyatt. **The Oil and Gas Fields of Ontario and Quebec.** 248 pp. Index, bibliogr. *Canadian Geol. Surv. Memoir 81: Geol. Series No. 67.* Ottawa, 1915.

O'Neill, J. J. **St. Hilaire (Beloeil) and Rougemont Mountains, Quebec.** v and 108 pp. Map, diagrs., index, bibliogr. *Canadian Geol. Surv. Memoir 43: Geol. Series No. 36.* Ottawa, 1914. [A petrographic discussion preceded by a valuable section on the physiography of the Monteregian Hills—eight isolated hills which stand out prominently on the plain of the St. Lawrence lowland and form a sort of bridge between the Laurentian Plateau and the Appalachian Mountains.]

Bacon's excelsior map of Ontario. 1:850,000. W. J. Gage & Co., Toronto [1915].

UNITED STATES

General

Rusmisel, L. C. **Industrial-Commercial Geography of the United States.** ix and 294 pp. Ills., index. A. N. Palmer Co., New York, 1914. $1.25 5½ x 8½.

Another book added to the long list of commercial geographies. This one is somewhat different but still shows the faults so common to many of the others. In his preface the author says that commercial geography ''is a study of the centralization of industry.'' He follows this notion consistently throughout the text. Discussing the principal products he fails to stress sufficiently the exchange of products. In other words he omits too much of *commerce* and introduces primarily economics and processes.

The material is handled interestingly and clearly. In this respect it is much better than many earlier books. Illustrations are frequent and good. Only two maps occur, one of the route of the Erie Canal and one of the Panama Canal. Why do writers of geographies still persist in giving secondary consideration to maps? A list of elementary reference books for research work is given. At the close of each chapter is a set of questions entitled "For Research." EUGENE VAN CLEEF.

ALCIATORE, H. F. **Classification of American Summers.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 8, pp. 400-403.

ARCTOWSKI, HENRYK. **On Storm-Frequency Changes in the United States.** Diagrs., bibliogr. *Monthly Weather Rev.*, Vol. 43, 1915, No. 8, pp. 379-389.

BONNIN, R. **Le coton aux États-Unis.** Map, ills. *La Nature*, No. 2198, 1915, Nov. 13, pp. 305-309.

—— **Climatological Data for the U. S. by Sections, September, 1915** (Vol. 2, No. 9). Maps, diagr. *U. S. Weather Bur.* [*Publ.*] *No. 565.*

—— **Cotton Production and Distribution: Season of 1914-15.** 102 pp. Maps, diagrs. *Bur. of the Census Bull. 131.* Washington, 1915.

COUPIN, HENRI. **L'industrie minière et métallurgique aux États-Unis.** Ills. *La Nature*, No. 2199, 1915, Nov. 20, pp. 321-329.

—— **Geographic Board, United States, Decisions of the, Nov. 3, 1915.** 1 p. Washington, D. C., 1915.

GRAVES, H. S. **Report of the Forester.** 31 pp. From *Ann. Rept. Dept. of Agriculture, 1915.* Washington, D. C.

KNAPP, BRADFORD. **Diversified Agriculture and the Relation of the Banker to the Farmer.** 15 pp. *U. S. Dept. of Agric., Office of the Secr., Circular No. 50.* Washington, D. C., 1915. [Arguments against the one-crop system of the South.]

PAULLIN, C. O. **The Carnegie Institution's Atlas of the Historical Geography of the United States.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 4, pp. 108-109.

PAULSEN, OVE. **Den internationale plantegeografiske ekskursion i Amerika 1913.** Map, ills. *Geografisk Tidskrift*, Vol. 23, 1915-16, No. 3, pp. 83-108. Copenhagen.

[Six maps showing cotton production:] 1, Geographical location of cotton production in 1912 and movement from origin to ports; 2, United States, showing classification of states according to the quantity of cotton consumed in 1913; 3, Map showing cotton production centers in Mississippi and Texas; 4, United States, showing geographical location of cotton production in 1912; 5, Diagram showing movement of cotton in United States from origin to ports; 6, World, showing geographical location of cotton production in 1912. (United States maps on scale of 1 in. to 115 mi.). Board of Commissioners of the port of New Orleans, New Orleans, 1914.

North Atlantic States

BURT, F. H. **The Nomenclature of the White Mountains.** Bibliogr. *Appalachia*, Vol. 13, 1913-15, No. 4, pp. 359-390.

FRENCH, ALLEN. **Old Concord, [Mass.].** With drawings by L. G. Hornby. 186 pp. Map, ills., index. Little, Brown & Co., Boston, 1915. $3. 9½ x 6½.

GOLDTHWAIT, J. W. **The Origin of Lost River [N. H.] and Its Giant Potholes.** *Science*, No. 1093, Vol. 42, 1915, Dec. 10, pp. 834-836.

WADE, H. T. **The Freight Congestion at the Port of New York: Object Lesson Emphasizing Our Urgent Need of a Merchant Marine.** Ills. *Sci. Amer.*, Vol. 113, 1915, Dec. 25, pp. 554-555.

Scarborough's topographic map of the White Mountains and central New Hampshire. 1:126,720. The Scarborough Co., Boston, 1913.

Map of the street railways of the commonwealth of Massachusetts. 1:253,440. Public Service Commission, [Boston], 1915.

Topographic map of Massachusetts and Rhode Island. Compiled from U. S. Geological Survey atlas sheets, surveyed in 1884-1888 in cooperation with the states of Massachusetts and Rhode Island. 1:250,000. U. S. Geological Survey, Washington, 1915.

Map of the railroads of Connecticut. 1:380,160. Railroad Commissioners, [Hartford], 1915 (?).

Scarborough's official road map of the state of New York. [3 sections]: Adirondack; Western; Hudson River. 1:348,500. Scarborough Motor Guide Co., Indianapolis, 1915.

Western States

CAMPBELL, M. R., AND OTHERS. **Guidebook of the Western United States. Part A: The Northern Pacific Route, with a Side Trip to Yellowstone Park.** 212 pp. Maps, ills. *U. S. Geol. Surv. Bull. 611.* Washington, 1915.

The reviewer used this guidebook along the Northern Pacific between Seattle and Minneapolis. Though he found it very helpful, it was difficult properly to correlate the text description and the object described from the window of a train traveling forty miles an hour. Many descriptions, of course, relate to objects that are near at hand and are seen only for a moment. Earlier familiarity with the text would have helped to minimize this difficulty.

A valid criticism that applies especially to this volume is the unfulfilled promise of the preface which says that the ''story of the West'' should be so told as to ''meet fully the needs of the tourist who aims to understand all that he sees.'' He sees much more than geology and physiography; he sees man already dominating vast areas that recently were nothing but wilderness. Perhaps not over a tenth of the book is given to anthropogeography.

Most Northern Pacific travelers, last year, never before saw such wheat fields as were spread to the horizon along the route through western North Dakota. That country, till recently, was thought to be good only for grazing. How does the book explain this miracle? It merely mentions ''improved methods of agriculture'' and ''dry farming,'' without a word of definition. Here was a chance for a few illuminating remarks. A paragraph or two about the means used to store and conserve moisture and the various tillage methods employed for the absorption and retention of rainfall would have been especially interesting.

In making this criticism, the fact should be emphasized that many of the topics are full of interest for everyone, such as the paragraphs on early exploration and settlement, railroad development, mining at Butte and Helena, etc.

The rather annoying inadequacy of the index, which includes only railroad stations, is felt when desiring information on such a topic as the ''Belt Series.'' Only after eleven scattered allusions have been made on pages 98-141 do we find on page 146 a general statement as to the nature and the wide distribution of the formations composing this series. Well-indexed, the gist of the matter would have been easier to find.

But such imperfections may easily be remedied in later editions. The four guidebooks in the U. S. Geological Survey series are good to travel with or to have in the library and in addition will unquestionably stimulate interest in the earth studies among the people who live along the transcontinental lines. CYRUS C. ADAMS.

COONEY, P. J. **Marshall, the Discoverer of Gold in California.** Ills. *Ann. Publs. Hist. Soc. of So. California,* Vol. 9, Part 3, pp. 204-214. Los Angeles, 1914.

CRANE, W. B. **The History of the Salton Sea.** *Ann. Publs. Hist. Soc. of So. California,* Vol. 9, Part 3, pp. 215-224. Los Angeles, 1914.

ELIOT, S. A. **Conditions Among the Indians of the Northwest Coast.** 28 pp. Index. Board of Indian Commissioners, Washington, D. C., 1915.

GUINN, J. M. **How the Area of Los Angeles City Was Enlarged.** *Ann. Publs. Hist. Soc. of So. California,* Vol. 9, Part 3, pp. 173-180. Los Angeles, 1914.

JONES, E. L., JR. **A Reconnaissance in the Kofa Mountains, Arizona.** Maps. *U. S. Geol. Surv. Bull. 620-H,* pp. 151-164. Washington, 1915.

KIMBALL, H. H. **Solar Radiation Measurements at Santa Fe, N. Mex., and Maxima at Other Stations.** Diagr. *Monthly Weather Rev.,* Vol. 43, 1915, No. 9, pp. 439-445.

LIVINGSTON, M. M. **The Earliest Spanish Land Grants in California.** *Ann. Publs. Hist. Soc. of So. California,* Vol. 9, Part 3, pp. 195-199. Los Angeles, 1914.

MOURHESS, C. A. **Triangulation Along the Columbia River and the Coasts of Oregon and Northern California.** 149 pp. Maps, diagrs., ills., index. *U. S. Coast and Geod. Surv. Special Publ. 31.* Washington, D. C., 1915.

—— **Oregon, The State of: Its Resources and Opportunities. Official Pamphlet Published for the Information of Homeseekers, Settlers, and Investors, by the Oregon State Immigration Agent.** 320 pp. Maps, index. State Immigration Commission, Portland, Ore., 1915. 8½ x 6. [Prepared specially for the homeseeker. Government records and statistics used as basis of the information given.]

PALMER, A. H. **A Note on the Relation of Climate to Agriculture in California.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 8, pp. 398-400.

Railroad Commission map of Montana. 1:760,320. Montana Railroad Commission, [Helena], 1915.

SOUTH AMERICA

The Guianas, Venezuela, Colombia

Blanco-Fombona, R. **Tribus del alto Orinoco.** Ills. *Las Americas,* Vol. 1, 1915-16, No. 5, pp. 26-28. All Americas Assoc., New York.

Chamberlin, G. E. **British Guiana.** 7 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 44b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Cipriani, E. B. **Venezuela.** *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 48b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Ciudad Bolivar, Trade and Commerce of, Report for the Year 1914 on the.** 8 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5518. London, 1915.

Macari, Arturo. **Minas de esmeralda[s] [de] Coper y Muzo, Colombia.** Map. *Las Americas,* Vol. 1, 1915, No. 5, pp. 33-34. All Americas Assoc., New York.

—— **Surinam, Trade of, Report for 1913 on the.** 10 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5456. London, 1915.

—— **Venezuela and the Consular District of Caracas, Trade of, Report for the Year 1913-1914 on the.** 29 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5532, London, 1915.

Brazil

Crandall, Roderic. **Geographia, geologia, supprimento d'agua, transportes e açudagem nos estados orientaes do norte do Brazil, Ceará, Rio Grande do Norte, Parahyba.** 131 pp. Diagrs., ills., index. *Inspectoria de Obras contra as Seccas Publ. No. 4.* Ministerio da Viação e Obras Publicas, Rio de Janeiro, 1910.

—— **Pará, Consular District of, Trade of the, Report for the Year 1914 on the.** 27 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5526. London, 1915. [The alarming decline in the revenues of Pará and Amazonas has naturally been continued during 1914. The total volume of trade for that year is only one-third of the amount for 1910. The war has been responsible for the failure to float the projected Brazilian loan and has thus dealt a fatal blow at the hoped-for financial reconstruction of these states.]

Reis, Aarão. **Relatorio dos trabalhos executados durante o anno de 1913.** xl and 244 pp. *Inspectoria de Obras contra as Seccas Publ. No. 37.* Ministerio da Viação e Obras Publicas, Rio de Janeiro, 1914. [The introduction summarizes the progress of irrigation work during 1913 in the northeastern states of Brazil.]

Small, H. L. **Geologia e supprimento d'agua subterranea no Piauhy e parte do Ceará.** 147 pp. Maps, diagrs., ills., index. *Inspectoria de Obras contra as Seccas Publ. No. 32.* Rio de Janeiro, 1914. [Accompanied by two geological maps, 1:1,000,000, which together cover all of Piauhy, except the southwestern portion, and the western and coastal parts of Ceará.]

Sopper, R. H. **Geologia e supprimento d'agua subterranea em Sergipe e no nordéste da Bahia.** 103 pp. Maps, diagrs., ills., index, bibliogr. *Inspectoria de Obras contra as Seccas Publ. No. 34.* Rio de Janeiro, 1914. [Accompanied by a geological map, 1:1,000,000, of Sergipe and northeastern Bahia.]

EUROPE

General

Tacitus. **Dialogus; Agricola; Germania.** (Series: The Loeb Classical Library.) The Dialogus translated by William Peterson; Agricola and Germania translated by Maurice Hutton. 371 pp. Maps, indexes. The Macmillan Co., New York, 1914. $1.50. 7 x 4½.

The geographer's interest in Tacitus' "Agricola" and "Germania" lies mainly in the fact that they preserve for us a knowledge of Britain and Germany and their peoples at the close of the first century of our era. While the account of the social organization of the ancient Britons and Teutons is vivid and realistic, the description of the topographical features does not reflect even the knowledge of the day, for, as Professor Hutton points out in his introduction to "Agricola," Tacitus is "the rhetorician and humanist who hates maps—large or small—and geography" and his concepts, in spite of the intervening hundred years, have not advanced beyond Strabo. Two maps show Britain and Germany according to Tacitus. The Latin text occupies the left-hand pages, and the English translation of the corresponding passages, the right-hand pages.

WILLCOX, W. F. **The Expansion of Europe in Population.** *Amer. Econ. Rev.*, Vol. 5, 1915, No. 4, pp. 737-752.

From 1750 to 1914, the average annual increase in the population of Europe was approximately two millions. But, for a century or more, the population of China has been about stationary. Estimates for the population of Africa also furnish a striking contrast to that of Europe; for, in the last thirty-two years, the population of Africa has decreased some 70 millions. (With regard to the probable fallacy of this decrease, see the paper by H. Ditzel listed in the January *Review*, p. 83.) Hence the conclusion that where the influence of European outflowing currents of population have not been deeply felt, as for example in China and Central Africa, the native population has remained nearly or entirely stationary—in some cases it actually has decreased. Contrary to popular opinion, the net result of the expansion of European population, through emigration to other parts of the world, has been a great increase in the aboriginal peoples in the regions to which Europeans have migrated. For example, after a consideration of all the evidence, Mr. Willcox concludes that "the influx of whites into America, while it may not have caused, has certainly been accompanied by, an increase of the Indians in that hemisphere." A hundred years ago the world's population was not far from one billion; at present, it is approximately one billion and two-thirds. "This addition of 650,000,000 to the world's population is the best measure and at the same time the best justification of the expansion of Europe."

AVARD L. BISHOP.

COUPIN, HENRI. **Les races européennes.** *La Nature*, No. 2203, 1915, Dec. 18, pp. 393-394.

EREDIA, F. **Mediterranean Pressure Types.** Maps. *Symons's Meteorol. Mag.*, No. 598, Vol. 50, 1915, p. 157. [Two diagrams of southern Europe, illustrating two extreme types of atmospheric pressure distribution (anticyclonic, Jan. 24, 1907; cyclonic, Jan. 23, 1915).]

HARDING, CHARLES. **Battle Weather in Western Europe, August, 1914, to April, 1915.** *Quart. Journ. Royal Meteorol. Soc.*, No. 176, Vol. 41, 1915, pp. 337-348.

BRITISH ISLES

BOWLEY, A. L. **The Effect of the War on the External Trade of the United Kingdom: An Analysis of the Monthly Statistics, 1906-1914.** 55 pp. Diagrs. University Press, Cambridge, 1915. G. P. Putnam's Sons, New York. 60 cents. 9 x 5½.

A condensed analysis giving the substance of four lectures delivered at the London School of Economics and Political Science. The topics deal with "the value of imports and exports in the aggregate, trade in the principal commodities, aggregate quantities and prices and trade with special countries." In his summary, the writer says that the value of imports from non-belligerent countries has changed but little; that, on the other hand, the value of exports and re-exports has greatly diminished, though still well above that of a decade ago; and that the present great excess of imports over exports does not imply that the United Kingdom is becoming a debtor among the nations, as the deficiency is practically met by the high returns from shipping, by interests, profits, etc., from external sources. Lack of elaboration in the analysis is explained by the pressure of rapidly moving events and the necessity for immediate judgment for utility in the problem of reconstruction. (For papers related to this topic, see "The War and the World's Trade," by A. L. Bishop, and "The Slight Effect of the War on United States Total Commerce," by Mark Jefferson, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 641-650 and 650-651, respectively.)

BOLTON, W. F., AND R. S. KENNEDY. **Round Edinburgh by Motor: Being Circular Routes Between Tay and Tweed.** 87 pp. Colstons Ltd., Edinburgh, 1914. 1s. 7½ x 5.

CLARK, J. E. **Report on the Phenological Observations from December 1913 to November 1914** [in the British Isles]. Diagr. *Quart. Journ. Royal Meteorol. Soc.*, No. 176, Vol. 41, 1915, pp. 285-314.

DAVIDSON, K. W. **The Making of a Great Modern Harbor—Liverpool.** Bibliogr. *Journ. of Geogr.*, Vol. 14, 1915-16, No. 5, pp. 150-153.

FROST, WESLEY. **United Kingdom: Ireland.** 39 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 19n. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

GWYNN, STEPHEN. **The Famous Cities of Ireland.** xii and 352 pp. Ills., index. The Macmillan Co., New York, 1915. $2. 8 x 5½.

MILL, H. R., AND H. E. CARTER. **The Wet Winter of 1914-1915.** Maps, diagrs. *Quart. Journ. Royal Meteorol. Soc.*, No. 176, Vol. 41, 1915, pp. 251-284. [A discussion of the unusually wet and warm weather experienced over England and Wales during the winter 1914-15. The work is based chiefly on maps prepared by the British Rainfall Organization and is illustrated with maps and tables. A comparison is made with previous years of abnormal rainfall, i. e., 1911-12, 1876-77, 1868-69.]

P[HILLIPS], G. C. **The Land After the War: A Business Proposition.** 54 and 20 (advertising) pp. The St. Catherine Press, London, 1915. 1s. 7½ x 5. [Suggests improvement of agricultural methods in England.]

THE LOW COUNTRIES, LUXEMBURG

ENSOR, R. C. K. **Belgium.** (Series: Home University Library.) 256 pp. Index. Henry Holt & Co., New York, 1915. 50 cents. 7 x 4½.

OSSWALD, PAUL. **Belgien.** (Series: Aus Natur und Geisteswelt.) 118 pp. Maps. B. G. Teubner, Leipzig, 1915. Mk. 1.25. 7½ x 5.

Two books on the same theme, one by an English, the other by a German author, both written because of the interest awakened through the great war. Mr. Ensor declares that "the German government must have departed from its usual practice if it did not employ agents to favor such a process," namely, the extension of Flemish influence. He informs us that when he says "is" of anything Belgian, he means "was when the war broke out," and he does not disguise the hope that this means also "will be again when the war is over."

Ensor disclaims any full treatment of social conditions, history, or statistics. His aim is rather to realize to his readers the national character and achievements of the Belgian people, whom he characterizes as "a nation" despite the contrary word of critics—an old nation, a proud nation, and a nation with lessons to teach as well as to learn.

The first chapter deals with the influence of geography on the character and destiny of the people. Then the people and their history are characterized. A vivid story of the "historic subjection of Belgium" emphasizes to the reader, without asserting it, the marvelous capacity for recovery which this sturdy little people has shown in the past and may be expected to show in the future.

The Belgian Constitution, Politics and Parties, Social Conditions and Agencies, and Art and Literature are captions which reveal the scope of the work. There is a brief bibliography and an adequate index.

Osswald in like manner betrays his attitude in asserting that Germany's tasks in Belgium are so manifold and difficult that full knowledge of the development of conditions will alone show the way to reconstruction and new construction. Here at the outset we are met with the Teutonic assumption of a *right to be in Belgium* and of a permanent work to do. However, the author spares us a discussion of Belgian neutrality and other questions relating to the present war. The volume therefore professes to give a dispassionate story and to place before the reader a dispassionate and objective judgment.

The author, having been called to military service, consents to publish the volume in an incomplete state in consideration of the "significance of Belgium for our people." There are four parts: The Country, The People, Historical Review to 1830, and Belgium in the Nineteenth and Twentieth Centuries. In reviewing the facts of Belgian geography, the position of the country is thus vividly set forth,—"Western and Central Europe, the continent and island world here push upon each other."

The closing chapter, on the Belgium of recent decades, deals with modern conditions under the heads of Political History, Constitution, Government, Administration of Justice, Military Affairs, Industrial and Social Conditions, Spiritual Conditions and Intellectual Life. Both volumes are an interesting part of the abundant literature which this afflicted country has called forth during the past eighteen months. A. P. BRIGHAM.

BEEKMAN, A. A. **Uit het verslag aan de koningin over de openbare werken in het jaar 1914.** *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 32, 1915, No. 7, pp. 831-847. [Abstract of the 1914 report of the Dutch Department of Public Works: deals with river regulation, canals, reclamation of land from the sea, etc.]

—— **Rotterdam and the Consular Posts in the Netherlands, Trade, Shipping, and Agriculture of, Report for the Year 1914 on the.** 60 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5523. London, 1915.

SCHÜTTE, GUDMUND. **Et maskeret Belgienskort hos Ptolemaios.** Maps. *Geografisk Tidskrift*, Vol. 23, 1915-16, No. 3, pp. 108-111. Copenhagen.

Skattum, O. J. **Det geografiske grundlag for Belgiens handel.** *Norske Geogr. Selskaps Aarbok,* Vol. 25, 1913-14, pp. 43-53.

Wieder, F. C. **Nederlandsche historisch-geographische documenten in Spanje: Uitkomsten van twee maanden onderzoek.** Map, diagr., index., bibliogr. *Tijdschr. Kon. Nederl. Aardrijk. Genoot.,* Vol. 31, 1914, No. 6, pp. 693-724; Vol. 32, 1915, No. 1, pp. 1-34; No. 2, pp. 145-187; No. 3, pp. 285-318; No. 6 (individual pagination: 158 pp.); No. 7, pp. 775-824.

Wilmore, A. **Belgium: The Battleground of Europe.** Map. *Journ. Manchester Geogr. Soc.,* Vol. 30, 1914, Pts. 3-4, pp. 125-129.

The port of Amsterdam. 1:20,000. Accompanies "A Short Account of the Docks, Harbour Works and Trading Establishments of the City of Amsterdam," Town-Printing Office, Amsterdam, 1914. [The book was reviewed in the January *Review,* p. 68.]

Germany

Scheu, Erwin. **Der Schwarzwald.** (Series: Deutsche Landschaftstypen.) 11 pp. Ills. T. Thomas, Leipzig, 1914 (?). 10 x 7.

A promising series of brief, illustrated accounts of typical German regions is inaugurated with this tiny work. It takes us back to a peneplanation of a folded "Variscian" mountain range, stretching across Germany and France, and tells where in the Black Forest we get a view of what is left of it. This was a Cretaceous baseleveling, followed by deposition of Jura and Trias rocks now found nearly flat-lying on the Black Forest border. Then came an uplift with arching from the Vosges to the Black Forest, and fractures along the borders, separating the mountain masses by the down-dropped Rhine valley as it is today. Then re-baseleveling, renewed fractures, and erosion, with a little glaciation about the Feldberg, shaped the present landscapes.

Mark Jefferson.

Bellet, Daniel. **Le commerce allemand et les raisons de son développement.** *Revue des Sci. Polit.,* Vol. 34, 1915, Aug. 15, pp. 59-85.

Cambon, Victor. **La marine de commerce allemande.** Diagrs., ills. *La Nature,* No. 2194, 1915, Oct. 16, pp. 241-246.

Mehlis, C. **Die älteste Karte Germaniens.** Maps, diagr. *Geogr. Anzeiger,* Vol. 16, 1915, No. 11, pp. 321-327.

Russia

Little, F. D. **Sketches in Poland.** Written and painted by —. With an historical postscript. xi and 344 pp., ills. F. A. Stokes Co., New York, 1914. $2.50. 9 x 6.

Poland, hallowed by the suffering and martyrdom of thousands, has been forgotten for a long time. Now that her soil is again a huge battlefield much is being written about her. This book is a series of sketches drawn with a sympathetic hand and an artist's eye giving the reader much of the local color and leading characteristics of the people, such as their whole-hearted hospitality and their intense patriotism. The bad roads are strongly emphasized. The larger part of the book is given to a description of Cracow with its remarkable museum, numerous churches and art treasures.

Blink, H. **De Russische oostzeehavens naar hunne beteekenis voor den uitvoer en invoer van Rusland.** Maps. *Tijdschr. voor Econ. Geogr.,* Vol. 6, 1915, No. 11, pp. 427-439. The Hague.

Martel, E. A., and L. de Launay. **La Mer Noire et ses ports.** Map, ills. *La Nature,* No. 2199, 1915, Nov. 20, pp. 329-334.

—— **Railway, The, to the Murman Coast of Russia.** Map. *Commerce Repts.,* No. 288, 1915, pp. 970-973. Bureau of Foreign and Domestic Commerce, Dept .of Commerce, Washington, D. C., 1915. [See extended reference in article "Russia's War-Time Outlets to the Sea" in this number on pp. 128-132.]

Rothaug, J. G. **Die Verbreitung der Polen.** Map. *Kartogr. u. Schulgeogr. Zeitschr.,* Vol. 4, 1915, No. 8, pp. 121-123. Vienna.

—— **Russia and Her Wealth.** *Twentieth Century Russia,* Vol. 1, 1915, No. 1, pp. 1-14. London.

Balkan States, including Rumania

—— **Balkan Wars, the, Causes and Conduct of, Report of the International Commission to Inquire into the.** 418 pp. Maps, ills. *Division of Intercourse and Education, Carnegie Endowment for International Peace, Publ. No. 4.* Washington, 1914. 10 x 7.

The purpose of this investigation was "to inform public opinion and to make plain just what is or may be involved in an international war carried on under modern conditions.'' This important statement in the preface is far too sweeping, because the Balkan wars were marked by the fierce national animosity which has always characterized the history of that region. The atrocities for which the peninsula has acquired sinister fame are unknown in the modern history of western Europe. Hence, the sense conveyed by the above citation cannot apply to ''international wars carried on under modern conditions.'' The conduct of the armies grappling with each other in Europe since August, 1914, is a refutation of this statement. Even the treatment of the Belgian noncombatant population by the Germans was mild compared with the fate meted out to unarmed Bulgarians, Serbians, or Greeks by their enemies.

Apart from such zealous advocacy of the cause of peace, the work is substantial and has the merit of having been written in a thoroughly impartial spirit. The origin of the two Balkan wars is treated with historical accuracy. Passages dealing with ethnography and national aspirations are presented with the lucidity which accompanies correct information acquired at first hand. The maps illustrating these passages are especially valuable. An interesting comparison is afforded by the two colored ethnographic maps of Macedonia, one representing the Bulgarian point of view, after Kantchev, the other the Servian point of view, after Cvijić—the latter better known to geographers (see *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 479-480). As a contribution to the Balkan race problem, and in spite of its fragmentary character, the book ranks among the best written in the English language, and no student of Balkan humanity can afford to ignore its contents.

BAEDEKER, KARL. **Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern: Handbuch für Reisende.** 2nd edit. lxxiv and 484 pp. Maps, index. Karl Baedeker, Leipzig, 1914. Mk. 8. 6½ x 4½. [Revised and enlarged from the 1905 edition. New text consists mainly of archeological and architectural notes, thereby rendering the guidebook serviceable to scholars as well as travelers. Important additions of maps and plans.]

BALDACCI, ANTONIO. **Itinerari albanesi del 1896.** Ills. *Boll. Reale Soc. Geogr.*, Vol. 4, 1915, No. 9, pp. 925-958; No. 10, pp. 1020-1044. Rome.

BLINK, H. **De opkomst en economische beteekenis van Roemenië.** Ills., bibliogr. *Tijdschr. voor Econ. Geogr.*, Vol. 6, 1915, No. 12, pp. 465-482. The Hague.

BLINK, H. **De Bulgaren en hun land.** *Vragen van den Dag*, Vol. 30, 1915, No. 11, pp. 817-827. Amsterdam.

—— **Bulgaria, Trade of, Report for the Year 1914 on the.** 15 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5506. London, 1915.

NEWBIGIN, M. I. **Macedonia: The Balkan Storm Centre.** Maps. *Scottish Geogr. Mag.*, Vol. 31, 1915, No. 12, pp. 636-651. [An excellent paper, thoroughly geographical in viewpoint.]

WEDDELL, A. W. **Greece.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915. No. 7c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Statistics for ''old'' Greece (prior to the Balkan wars) and ''new'' Greece are distinguished.]

Map of the peninsula of Gallipoli and the Asiatic shore of the Dardanelles. 1:63,360. Geogr. Sec., General Staff, War Office, London, 1915.

[Map of Europe and the Near East] compiled by the Royal Geographical Society under the direction of the Geographical Section of the General Staff. 1:1,000,000. Sheet L 35 North, Bucuresti. Royal Geographical Society, London, 1915. [The important map of Europe and the Near East on the millionth scale, of which this is a sheet, was described in detail in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 776-777. This sheet covers the quadrangle enclosed by the meridians of 24° and 30° E. and the parallels of 48° and 44° N. and thus includes, besides most of Rumania, Bessarabia and eastern Transylvania.]

AFRICA

GENERAL

ENGELL, M. C. **Verbreitung und Häufigkeit des Elefanten und Löwen in Afrika.** 84 pp. Maps. *Ergänzungsheft No. 171 zu Petermanns Mitt.* Gotha, 1911. Mk. 7.40. 11 x 7½.

The fauna of the future will be a dwarf one, compared with that of the present, because of the extinction of all large animals not domesticated by man. This tendency is shown in the excellent study of the distribution and abundance of the African elephant and lion by Engell. These animals are representative of the classes having herbivorous and predaceous food habits, and are probably a safe guide to the changes which may be expected of the African fauna as a whole. The elephant is described fully in about sixty pages out of the total of eighty-four. The general results are summarized in two excellent colored maps, one for each species (reviewed in the *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 476-477). The map of the elephant shows the areas in which it became extinct in prehistoric times, during historic times, and during the last century. These areas are largely strips along the southern border of the Sahara, or patches along the coast where commerce has progressed, except for the large area in South Africa. With regard to present distribution, the map shows respectively where the elephant is rare, frequent, generally distributed, and the small areas where it is legally protected. The area of greatest abundance is almost completely surrounded by an area of smaller numbers. Vegetation and man are the two main factors which influence its abundance.

The distribution of the lion depends directly upon quite different conditions. Its northern limit, south of the Sahara, appears to be determined by the tropical summer rains. Its food consists largely of various kinds of grazing animals, and, as these are mainly animals of the open or forest margin, its range is more restricted in forests than that of the elephant. The lion is absent altogether from a large part of the humid forested region near the Gulf of Guinea and from the French and Belgian Congo.

The map shows where it was exterminated within historic times, where it has become extinct during the last century, and where it is rare in the north. South of the Sahara its area of great abundance is much like that of the elephant, varying in important details, where, as with the elephant, it is surrounded by a zone of lesser abundance, and extermination has progressed along similar lines.

Both of these animals show discontinuity in their range caused by the Sahara. The isolated lion colony in the oasis of Air, about 400 miles northwest of Lake Chad, is of special interest for its bearing upon the increasing aridity of the climate. Attention is called to the probable former extension of the dense western forests and their humid climate to the mountainous parts of east Africa, since the birds of Mount Elgon in British East Africa are more clearly related to those of the mountains of Kamerun in west Africa than to those of the eastern mountains.

Progressive extinction, forcibly illustrated by this investigation, begins at the limits of the range of an animal and moves towards the regions of greatest abundance. The geographer will find throughout the paper a wealth of information illustrating the influence of geographic controls upon animal life, as climate, topography, character of the vegetation, commercial demands for ivory, protection of herds from the lion, habits of the natives, and even the influence which the tsetse fly has upon the number of lions.

CHARLES C. ADAMS.

LEWIN, EVANS. **The Germans and Africa.** xviii and 317 pp. Map, index. F. A. Stokes Co., New York, 1915 (?). $3.60. 9½ x 6½.

Mr. Lewin tells how the German colonial movement originated and grew in Africa and traces it through the history of the four German colonies. His studies and opportunities especially fitted him to do an excellent piece of work in writing this book. His amusing narrative of the origin of German East Africa, the first of the colonies, shows a phase of colonial enterprise that has not been uncommon in barbarous lands but perhaps is little known to the public.

In brief, Dr. Karl Peters and Count Joachim Pfeil traveled unostentatiously in the steerage to Zanzibar and then disappeared over the edge of the continent. Peters was soon busy in the highlands of Usagara making treaties with the tribal chiefs who, one after another, affixed their marks to documents ceding their lands to Dr. Peters in behalf of the Society for German Colonization, which soon evolved into the German East Africa Company. The chiefs did not know what he was talking about, but he was gracious and kind and the beverages he dispensed were stimulating to good feeling; and so Peters went home with concessions to a large territory. The German government, of course, felt in duty bound to extend its protection over the region, thereafter greatly enlarged, that had been acquired by the enterprise of its own citizens. Mr. Lewin quotes the words of Bismarck, who said that the treaties were probably as "valid and as valuable as most of those that have been made with native chiefs by pioneers of all nationalities."

This was the initiation of Germany's great colony on the Indian Ocean. The author treats of the origin, progress, resources, and importance of all the colonies. Probably no other book in English so well and fairly deals with this topic; but, unfortunately, he says nothing of the scientific method which the Germans applied to the study, the development, and the mapping of their African domain,—a method which might well be a model for other colonial powers. He censures the Germans for their brutal and tactless treatment of the natives, which especially characterized the early days of the four colonies. Mr. Lewin's suggestions as to the disposition of the captured colonies after the war are hardly worth mentioning. These pages are the only weak feature of a book which otherwise should be in every collection of Africana. Cyrus C. Adams.

Dove, Karl. **Die grossen Wirtschaftsgebiete Afrikas.** *Weltwirtschaft,* Vol. 5, 1915, No. 8, pp. 158-162. Berlin.

Sudan and Upper Guinea

Yerby, W. J. **British West Africa.** 8 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 67b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. 1915.

Plan of Port Harcourt and surroundings. 1:62,500. Topographical Branch, Nigeria Survey, [Entebbe], [1915]. (Gift from Messrs. W. & A. K. Johnston, Edinburgh).

Plan of coalfield at Enugu-Ngwo. 1:12,500. Topographical Branch, Nigeria Survey, [Entebbe], [1915]. (Gift from Messrs. W. & A. K. Johnston, Edinburgh).

Congo Basin and Lower Guinea

—— **Angola (Portuguese West Africa), Trade of, Report for the Year 1914 on the.** Map. 8 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5529. London, 1915.

Dupont, J. **Étude économique sur le Katanga.** 127 pp. Maps. Edouard Duchemin, Paris, 1913. Frs. 4. 10 x 6½. [The value of the Katanga as a national asset is investigated in these papers. The subsoil is considered richer in resources than the surface.]

—— **French Congo, Trade of the, Report for the Years 1912-13 on the.** 14 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5494. London, 1915. [Trade in the French Congo will be greatly facilitated by the construction of the projected railroad line from the harbor of Pointe Noire to the hinterland. At present the colony is served by the Matadi-Léopoldville line of the Belgian Congo.]

—— **Katanga, Trade of, Report for the Year 1914 on the.** 14 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5520. London, 1915.

Lang, Herbert. **An Explorer's View of the Congo.** Ills. *Amer. Mus. Journ.* Vol. 15, 1915, No. 8, pp. 379-388. Amer. Mus. Nat. Hist., New York.

ASIA

Turkey in Asia, Arabia, Caucasia, Iran

Leonhard, Richard. **Paphlagonia: Reisen und Forschungen im nördlichen Kleinasien.** xiv and 401 pp. Maps, ills., index. D. Reimer (E. Vohsen), Berlin, 1915 Mk. 20. 8 x 10½.

The distinctive merit of this work is that it throws light on a region which ranks among the least known of Asia Minor on account of its situation off the path of the great peninsular highways around which Anatolian life clustered. The book is the result of three trips, undertaken in 1899, 1900, and 1903. Delay in its publication does not detract from its value, as exploration has not been conducted since on the same extensive scale in that part of Asia Minor. On the topographical and the geological map (listed below) which accompany the volume, the route Angora-Castamuni-Ineboli is based on original surveys by the author. The list of elevations he gives (determined by aneroid) is the most complete existing for northern Asia Minor.

This is the first time that the structure of the region beginning at the great bend of the Sakaria south of Eregli and extending to the north of Angora has come under the scrutiny of a modern scientist. Doctor Leonhard's researches deal largely with the history of Tertiary vulcanism. In this he has acted as the organizer who has ably followed up Ainsworth's and Tchihatcheff's pioneering. It is regrettable that the unfriendly attitude of the inhabitants prevented him from prosecuting his work in greater detail.

In the historical domain the author's discovery of tumuli in Paphlagonia is a notable extension of Ramsay's and Koerte's researches in Phrygia. The most valuable section of the work is given in Chapter 6, which is entirely devoted to rock-tombs. Among them the author is quite at home, and he believes they are the remains of an independent development of Hittite practice. It is interesting to note that the remarkably honey combed character of the limestones and eruptives in this region affords an environment which is eminently fitted to favor this method of burial and even perhaps to have given rise to it, without the intervention of foreign influences.

In the domain of ethnography Doctor Leonhard describes at length the Kizilbash communities he has had the opportunity to visit. It is disappointing to find so little reference to the mysterious origin of this people or to the reason for its presence in that particular district.

Bonnin, R. **Les richesses minières de la Turquie d'Asie.** *La Nature,* No. 2202, 1915, Dec. 11, p. 382.

—— **Isfahan, Consular District of, Trade of the, Report for the Year 1914 on the.** 51 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5521. London, 1915. [Interesting statistics pertaining to transportation costs. These vary according to security of travel on the roads and supply of beasts of burden. Apprehension is being aroused over the latter factor, for the present attitude of indifference to breeding is steadily reducing the supply.]

—— **Persia, Trade of, Report for the Year 1913-1914 on the.** 17 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5515. London, 1915.

Topographische Karte eines Teiles des nördlichen Kleinasien mit Zugrundelegung der Routenkarten des Dr. Richard Leonhard und Eintragung der Routen anderer Reisenden. Bearb. von Dr. Richard Kiepert. 1:400,000. Accompanies "Paphlagonia" by Richard Leonhard, D. Reimer (E. Vohsen), Berlin, 1915.

Geologische Übersichtskarte eines Teiles des nördlichen Kleinasien nach eigenen Beobachtungen und Verwertung älterer Angaben. Bearb. von Dr. Richard Leonhard. 1:400,000. Accompanies "Paphlagonia" by Richard Leonhard, D. Reimer (E. Vohsen), Berlin, 1915.

SIBERIA

Czaplicka, M. A. **Aboriginal Siberia: A Study in Social Anthropology.** With a preface by R. R. Marett. xv and 374 pp. Map, ills., index. Oxford University Press (Amer. Branch), New York, 1914. 9 x 6.

The method used here is that which, under the influence of Sir J. G. Fraser, has become standard for work in anthropology in the English universities. Miss Czaplicka has examined the great mass of original study of Siberian conditions, most of it in Russian, and collated the material under several topics, with abundant citations and a running comment which is explicative of obscure points. A commendable element of her work is the evaluation of the several sources upon which she has drawn. In her notes and in her extensive bibliography of Siberian literature she does not seem to have noted the extremely valuable work of the late Jeremiah Curtin on the Buryat. She has advanced a step toward the clarification of the Siberian ethnic situation by her establishment of the Palæo-Siberians and the Neo-Siberians. It will be comprehended that such a distinction is valuable only as a convenience and must be retired to a subordinate position when it has accomplished its end of leading toward the settlement of the race problems involved. In her chapter on epicene shamanism she has done little more than attempt to assemble material; a fuller acquaintance with the psychology of religion would have made her comments more valuable. The work will at once take its place as an introduction to the study of the wild races of Siberia and will make familiar the great mass of Russian literature of exploration to the scholarship of the western world.

William Churchill.

Van Balen, C. L. **De handelsweg over zee naar Siberië.** *Tijdschr. voor Econ. Geogr.,* Vol. 6, 1915, No. 8, pp. 299-305. [See also note under Geographical Record in this number on "Northern Routes of Commerce between Europe and Asia."]

INDIA

Böllert, Paul. **Die Volksdichte in der oberen Gangesebene auf Grund des "Census of India, 1901."** Inaug.-Dissertation . . . Univ. Göttingen. 70 pp. Map. Göttingen, 1911. 9½ x 7.

Heins, Hermann. **Die Volksdichte im nordwestindischen Flachlande und ihr Zusammenhang mit den Bewässerungsverhältnissen.** Inaug. Dissertation . . . Univ. Göttingen. 80 pp. Map. Göttingen, 1909. 9½ x 7.

These doctor's theses are notable examples of what can be done in organizing effectively the geographical material of lands not visited by the authors. Both authors hav assembled the available literature of their chosen fields and from it have extracted th essence of geography. An elaborate map, 1:2,500,000 and 1:3,000,000, respectivel showing minutely the density of population, accompanies each dissertation.

Most geographers would want to find a closer relationship established between th various geographical conditions treated and the distribution of population. One feels occassionally, the need of the author's experience in their fields. The reviewer ha observed conditions in northern India that make him less discouraged over the hid bound conservatism of the people.

American teachers of geography will find in these papers excellent suggestions fo their advanced students in working out local problems. We need just such intensiv treatments of units of our own country. SUMNER W. CUSHING.

LEONARD, W. A. **Ceylon.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915 No. 51a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington D. C.

SLEEMAN, W. H. **Rambles and Recollections of an Indian Official.** xxxix an 667 pp. Map, ills., index, bibliogr. Oxford University Press (Amer. Branch), Ne York, 1915. 6s. 7½ x 5. [Reprint of the original, published in 1844.]

MALAY ARCHIPELAGO, INCLUDING THE PHILIPPINES

GIBBS, L. S. **A Contribution to the Flora and Plant Formations of Mount Kinabal and the Highlands of British North Borneo.** 240 pp. Maps, ills. Reprint *Linnean Soc. Journ.: Botany*, Vol. 42, 1914.

The granitic peak Kinabalu in British North Borneo is the highest mountain in th Malay Archipelago. Miss Gibbs presents in this paper a brief description of the plan formations and an extended annotated list and descriptions of the new plant specie found. Attention is called to the influence of recent active erosion and sedimentatio upon the coastal vegetation. With the heavy rainfall, forests naturally tend to cove the entire surface. The primary or virgin forest is characterized by epiphytic rhododen drons, a herbaceous undergrowth, and large trees. The main factor limiting the exte of this forest is man; he clears it in patches for cultivation and then abandons it, givin rise to the secondary or younger forest. The author expresses the opinion that in th future greater care is needed in the use of the term ''rain forest.'' Numerous observa tions on the plants characterizing different habitats are included in the section on th itinerary and description of the vegetation; indeed, most of the facts on plant formatio are included in this narrative section. The standpoint and method of describing th vegetation used by H. N. Whitford and F. C. Gates in the Philippines is more moder and is superior to that of this paper.

On Kinabalu the following plant formations are recognized: (1) A secondary fores the cut-over jungle, from 2,500 to 4,000 feet; (2) primary high or virgin forest, fro 3,500 to 6,000 feet; (3) mossy forest, between 6,000 and 9,000 feet; (4) scrub forma tion on exposed serpentine; (5) low sheltered forest, between 9,500 and 10,500 fee composed of low (7 meters) dense-growing trees with little undergrowth and probabl with acid soil; (6) sub-summit dwarf forest, about 3 meters high, with no undergrowt becoming shrubby in open places; and (7) the granite core, open shrub formation, i rock crevices. CHARLES C. ADAMS.

BARTSTRA, S. **De inlander in Nederlandsch-Indië, beschouwd als onderdaan e psychisch wezen.** *Vragen van den Dag*, Vol. 30, 1915, No. 11, pp. 828-849. Amsterda

BLINK, H. **Industrieele mogelijkheden in Nederlandsch-Indië.** *Tijdschr. voo Econ. Geogr.*, Vol. 6, 1915, No. 12, pp. 496-501. The Hague.

BROUWER, H. A. **Reisbericht omtrent geologische verkenningstochten op ver schillende eilanden der Molukken.** *Tijdschr. van het Kon. Nederl. Aardrijk. Genoot* Vol. 32, 1915, No. 7, pp. 825-830. [A related paper by the same author, on the geolog of the Soela Islands east of Celebes, appeared in No. 4 of the same volume.]

KEMMERLING, G. L. L. **Topografische en geologische beschrijving van he stroomgebied van de Barito, in hoofdzaak wat de Doesoenlanden betreft.** Ma diagrs., ills., bibliogr., index. *Tijdschr. Kon. Nederl. Aadrijk. Genoot.*, Vol. 32, 191 No. 5, pp. 575-641; No. 7, pp. 717-774. [Accompanied by a geological reconnaissanc map, 1:750,000, of the drainage basin of the Barito River.]

—— **Philippine Islands, Trade and Commerce of the, Report for the Yea**

14 on the. 29 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5513. London, 15.

Piscicelli, Maurizio. **A Borneo: Note di viaggio.** Ills. *Boll. Reale Soc. Geogr.*, ol. 4, 1915, No. 11, pp. 1119-1140. Rome.

Piscicelli, Maurizio. **A Celebes: Note di viaggio.** Ills. *Boll. Reale Soc. Geogr.*, ol. 4, 1915, No. 12, pp. 1251-1276. Rome.

Rairden, B. S. **Dutch East Indies.** 9 pp. *Suppl. to Commerce Repts.*, Ann. Series, 15, No. 53a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washgton, D. C.

Staveren, J. A. van. **De Rokka's van Midden-Flores.** Ills. *Tijdschr. voor dische Taal-, Land- en Volkenkunde,* Vol. 57, 1915, No. 2, pp. 117-175.

Swart, A. G. N. **Elaeis Guineensis: Eene nieuwe cultuur in Nederlandschdië.** Ills. *De Indische Gids,* Vol. 37, 1915, No. 11, pp. 1553-1578. Amsterdam. uinea oil-palm.]

Ten Kate, P. **De weg van Oema i Rehe.** Map. *Mededeel. Nederland. Zendelingnoot.,* Vol. 59, 1915, No. 4, pp. 339-343. Rotterdam. [Route suvrey in Celebes.]

Cebu and Bohol, Philippine Islands. 1:200,000. Chart No. 15, Geographical Division, oast and Geodetic Survey, Manila, 1915.

AUSTRALASIA AND OCEANIA

Australia, New Zealand

Morgan, P. G., and J. A. Bartrum. **The Geology and Mineral Resources of e Buller-Mokihinui Subdivision, Westport Division.** 210 pp. Maps., ills., index. *ew Zealand Geol. Surv. Bull. No. 17 (New Series).* Wellington, 1915.

Wade, Arthur. **The Supposed Oil-bearing Areas of South Australia.** 54 pp. aps, diagrs., ills., bibliogr. *Geol. Surv. of South Australia Bull. No. 4.* Adelaide, 15.

Melanesia, Micronesia, Polynesia

urray, J. H. P. **Papua or British New Guinea.** With an introduction by Sir William MacGregor. 388 pp. Map, ills., index. Charles Scribner's Sons, New York, 1912. $3.75. 9 x 6.

In little more than a score of pages it has been very easy to review the whole history this best known region of New Guinea, the British possession which, with the German rritory of the north coast, divides the great island east of 141° E. Those of us who on, through perilous adventure, some scant knowledge of unknown and dangerous New uinea, will be the most ready to acknowledge that a score of pages amply suffices for e record before the coming of Sir William MacGregor. From that point the present lume is a complete history of the administrative problems involved in the establishent of peace and order among the wildest and rudest of human communities. Thereore it is a study of the amelioration of man. Governor Murray is singularly generous his note of sympathy with all the forces, including missionaries and gold miners, hich have converged upon the task of amelioration. We have every reason to regard is work as fundamental in the study of Papua. It is a manual necessary for the etter understanding of the records of missionary endeavor and the more formal reports linguistic and ethnological explorers who have begun a task which bids fair to become enormous value.

William Churchill.

Friederici, G. **Ein Beitrag zur Kenntnis der Trutzwaffen der Indonesier, üdseevölker und Indianer.** Maps, diagrs., index, bibliogr. *Baessler-Archiv,* 1915, o. 7, pp. 1-78.

Mayer, A. G. **The Men of the Mid-Pacific.** Ills. *The Scientific Monthly,* Vol. 1916, No. 1, pp. 5-26.

S[taal], J. J. **De Exploratie van Nieuw-Guinea.** Map. *Tijdschr. Kon. Nederl. ardrijk. Genoot.,* Vol. 32, 1915, No. 7, pp. 857-861. [Accompanied by a map, 1,000,000, of the surveys in the upper basin of the Mamberano River.]

Wade, Arthur. **Report on Petroleum in Papua.** 48 pp. Maps, diagrs., ills., bliogr. *(Australian Parliamentary Paper, 1914-15, No. 61, F 5163).* [Includes a geologic-physiographic sketch of a region in which much of the work was of a reconnaissance nature.]

The crossroads of the Pacific. Designed for the Hawaii Promotion Committee b H. P. Wood. [1:40,000,000.] Hawaii Promotion Committee, [Honolulu], [1915?].

The Hawaiian Islands, compiled from official records of the U. S. Navy Department U. S. Post Office Department and other sources under the direction of the Secretary o the Interior and the Director of the U. S. Geological Survey. 1:700,000. [U. S. Geological Survey, Washington], [1909].

Map of Hawaiian Islands showing steamship routes of the Inter-Island Steam Navigation Co., Ltd. [Scale not given.] [From Hawaii Promotion Committee, Honolulu.] [1915?].

Hawaii, Hawaiian Islands. 1:480,000. Hawaii Promotion Committee, [Honolulu] 1913.

Kauai, Hawaiian Islands. 1:240,000. Hawaii Promotion Committee, [Honolulu], 1908

Oahu, Hawaiian Islands. 1:240,000. Hawaii Promotion Committee, [Honolulu], 1908

City of Honolulu: map compiled for the Hawaii Promotion Committee by E. A. Southworth, C. E. 1:36,000. Hawaii Promotion Committee, Honolulu, 1915.

POLAR REGIONS

ARCTIC

GREELY, A. W. **The Stefánsson Expedition of 1913 to 1915.** Map. *Amer Mus. Journ.*, Vol. 15, 1915, No. 7, pp. 339-341. Amer. Mus. Nat. Hist., New York.

HOLMSEN, GUNNAR. **Spitzbergens jordbundsis.** Map, diagrs., ills. *Norske Geogr Selksaps Aarbok*, Vol. 24, 1912-13, pp. 1-132. [With summary in German, pp. 133-150. [Important investigation of ground-ice in Spitzbergen and its bearing on the genera problem of fossil ice.]

ISACHSEN, GUNNAR. **Green Harbour, [Spitzbergen].** Map, ills. *Norske Geogr Selskaps Aarbok*, Vol. 24, 1912-13, pp. 151-162. [The map, 1:100,000, is based on a original survey. Relief in contours; interval, 50 meters.]

ANTARCTIC

SKOTTSBERG, CARL. **The Vegetation in South Georgia.** 36 pp. Map, ills. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901-1903 unte Leitung von O. Nordenskjöld*, Vol. 4, No. 12. Lithogr. Inst. des Generalstab Stockholm, 1912. 11 x 8½.

The vegetation of the portions of the island of South Georgia which are adjacent t Cumberland and Royal Bays is here described. This island, being the ultimate emerse portion of the "Antartandes," is extremely mountainous in its topography and almos devoid of coastal plains. Trees and shrubs are wanting, grasses and mosses formin the predominant plant cover. The coast is fringed by the tussock-forming grass *Po flabellata*, nearly level areas are covered by tundra meadows of *Acaena adscendens*, th mountain slopes by mosses alone or by a light cover of grass. Mount Paget, the highes peak, reaches 6,000 feet, but vascular plants are not found above 1,500 feet. The are evidences of two glacial periods, the second of which left only a few areas of tundr exposed. The eighteen species of vascular plants on the island are all common to Fuegi and the Falkland Islands, but among the 157 species of mosses and lichens 46 per ce of the former and 24 per cent of the latter are endemic. FORREST SHREVE.

WORLD AS A WHOLE AND LARGER PARTS

BAUER, L. A., AND J. A. FLEMING. **Land Magnetic Observations, 1911-1913, an Reports on Special Researches.** 278 pp. Diagrs., ills. *Carnegie Institutio Publ. No. 175* (Vol. 2). Washington, D. C., 1915. $5. 12 x 10.

The world-wide scope of the work of the Department of Terrestrial Magnetism the Carnegie Institution of Washington is again exemplified by this volume. T descriptions of stations and reports of the observers, with accompanying views typical scenes, show clearly the varied and unusual conditions under which the resul have been obtained. Of the 904 primary and 79 secondary stations occupied in t three years, 284 are in Australia and most of the others are in South America, Africa, or Asia.

The results have been reduced to a common standard by means of instrumental comparisons at Washington at the beginning and end of a season's work. The wide range of dip often met with made it necessary to take account of the change in the correction to a dip needle with change in dip. The difficulty of deriving this relation accurately led the Department to design and construct a small earth inductor with a galvanometer which can be used in the field work without getting out of adjustment. This and a combination dip-circle and magnetometer of new design are described in detail.

Of the three "Reports on Special Researches" the first gives a detailed description of the new research buildings of the Department near Washington, and the second describes an inspection trip taken by the director, during which he observed the total solar eclipse of April 28, 1911, at Manua, Samoa. The third and most important gives the results of comparisons of magnetic standards from 1905 to 1914 and the derivation of the international magnetic standards of the Department. Direct comparisons have been made at thirty observatories and indirect comparisons have been obtained with the standards of eight others. These comparisons have served not only to provide the means for making homogeneous the field results of the different countries, but also to emphasize the importance of care in the determination of the constants of magnetic instruments.

A good deal of interesting geography may be found in the section entitled "Observer's Field Reports," which contains among other things an account of a crossing of the Sahara in 1913 from Algiers to Timbuktu. Daniel L. Hazard.

MATHEMATICAL GEOGRAPHY

Astronomical Geography

Kohlschütter, A. **Tafeln zur astronomischen Ortsbestimmung.** (Series: Luftfahrt und Wissenschaft.) 113 pp. J. Springer, Berlin, 1913. Mk. 8. 11 x 8.

This volume contains tables by which, with practically no computations at all, an aviator may determine his latitude and longitude by a simple altitude observation with quadrant or sextant and a noting of the time by his watch. The latitude is determined by an altitude observation on Polaris; the longitude by an altitude observation on one of twelve prominent stars whose corrections are tabulated for each degree of altitude from 10 to 60, both east and west, and for each degree of latitude from 39 to 60, especially applicable to northern Europe. Minor auxiliary tables and a star chart are included. James Gordon Steese.

Surveying and Geodesy

Close, C. F. **Text Book of Topographical and Geographical Surveying.** Revised by Capt. E. W. Cox. 2nd edit. v and 412 pp. Maps, ills., index. Harrison & Sons, London, 1913. 7s. 6d. 10½ x 7½.

Ever since its first appearance, Colonel Close's work has been the standard text in English, especially for military and geographic work; and this second edition, enlarged by about one half, will be warmly welcomed. The work contains not only complete tables and data for the finished work of a national survey, but also a section on field methods and results, with special reference to uncivilized regions. Numerous examples are cited from the actual experiences of the Royal Engineer officers who have been engaged in carrying out geographic and topographic surveys all over the world, notably in India, the Sudan, southern Nigeria, and Uganda, as well as from the Ordnance Survey in the United Kingdom.

The data on organization and conduct of topographic field parties, records of survey work, solution of typical problems, illustrated by field sheets and notes from actual practice, and complete sets of forms for astronomical work and various other computations are very valuable. The statements have been pruned down to the smallest possible compass without sacrificing intelligibility, and an astonishing amount of information has been included in one book. No expense has been spared in the preparation of the plates, most of which are in color. James Gordon Steese.

Hughes, A. J. **The Book of the Sextant, with Ancient and Modern Instruments of Navigation.** 63 pp. Diagrs., ills. James Brown & Son., Glasgow, 1915. 2s. 6d. 8 x 5½.

PHYSICAL GEOGRAPHY

Hydrography and Oceanography

Carpenter, Capt. Alfred, and Capt. D. Wilson-Barker. **Nature Notes for Ocear Voyagers**, being personal observations upon life in ''The Vasty Deep'' and fishes birds, and beasts seen from a ship's deck; with popular chapters on weather, waves and legendary lore. xvi and 181 pp. Map, ills, index. J. B. Lippincott Co. Philadelphia, 1915. $1.75. 9 x 6½.

A first-class volume for a ship's library. It is not an introduction to biology nor field guide but a little book full of interesting information about the things one see on a voyage and many others that the present writer wishes he had seen. It differ from most so-called elementary books in that it was written by men of competen knowledge, who have yet a reticence and self-restraint that has produced a thoroughl readable volume. It has a good index, too. What traveler by sea would not like t know about the whale's ''blowing,'' the flight of flying fish, the legend of the se serpent, or the creatures of the ocean depths? Mark Jefferson.

Van Ornum, J. L. **The Regulation of Rivers.** x and 393 pp. Ills., index. McGraw Hill Book Co., New York, 1914. $4. 9 x 6½.

A sane and comprehensive view of our river situation. This text-book on waterway can be used as a starting point for students of river systems. Opening with a clea argument for the improvement of waterways as a commercial necessity, the autho discusses in turn the commercial aspects, the general nature of rivers, the methods no employed for investigations and surveys, the various methods of river improvement, an the principles of regulation including channel contraction, the protection of erodibl banks, dredging, levees, and the control of the current. The great value of the boo lies in its non-partisan view of questions such as reservoir control, forest influence, an the value of levees. The chapter on investigations, surveys, etc., is a fresh and helpfu treatment and presents an often neglected phase of the subject which will help th student to interpret the charts, maps, and graphs so numerous in waterway report An extensive citation of examples from the rivers of the world gives the reader comparative view as well as a wide knowledge of the subject. The book ought to hav general circulation among students of waterways and can be highly recommended as safe view of existing conditions and necessities. Robert M. Brown.

Phytogeography and Zoögeography

Adams, Charles, C. **Guide to the Study of Animal Ecology.** xii and 183 p Ills., index. The Macmillan Co., New York, 1913. Mk. 1.25. 7½ x 5½.

This volume records the working tools of a teacher of animal ecology and should b as valuable as a source book to the teacher or student of ecology as is Poole's Inde to a librarian or the user of a library. The book is educational in aim and is no intended as a treatise on ecology.

The author has included a remarkably complete summary of the subject of ecolog and the point of view of the trained ecologist. He discusses the value and method o ecological surveys and gives directions for field work. Selected references, in mos cases with explanatory comment, are given for the various phases of work in ecolog The references include those to scientific technique, to the sources of information on th life histories of insects and allied invertebrates, the laws of environmental change, an ''the continuous process of adjustment between the environment and the animal, wit special reference to other organisms.'' The book should be consulted in connection wit the author's monograph on animal ecology, reviewed below, of which it was firs planned to form part. R. W. Sharpe.

Adams, Charles C. I: **An Outline of the Relations of Animals to Their Inlan Environments. II: An Ecological Study of Prairie and Forest Invertebrate** Maps, ills., bibliogr., index. *Bull. Illinois State Lab. Nat. Hist.*, Vol. 11, 191 Arts. 1 and 2, pp. 1-32 and 33-280. Urbana, 1915.

These two papers, which together form a unit monograph, give a comprehensive an inspiring discussion of prairie and forest as animal habitats. Careful studies of th effects of topography, climate, humidity, temperature, soil, ventilation, vegetation, an water are presented. The associations of each habitat receive full treatment, the plate giving illustrations of typical animals. ''The complexity of conditions upon land i much greater than in water, either fresh or salt. In other words the land habitats ar the most complex on earth.'' A ''dynamic and genetic'' classification of environment is presented. The dependence of the genetic method upon causes and conditions make impossible to divorce it from local conditions. The degradation of land is intimately ssociated with the formation of suitable habitats, and there is hence a rather definite uccession. Animals form an important part of their own environment. "Civilization s an attempt to make the environment 'to order,' but as yet man has not learned how o produce a permanent optimum along the lines of an ecological community." A table p. 28) shows the phases in the formation of inland environments. After the land has een elevated an unstable condition is produced. This is succeeded by a process of djustment as the land wears down, during which a definite sequence of habitats occurs, nd all changes are constructive. Finally a condition of stability is reached, which nds the cycle and climax formations are produced. The work ends with an annotated st of species of Illinois forests and prairies, and a complete bibliography.

A. S. Pearse.

ugmore, A. R. **The Romance of the Beaver, Being the History of the Beaver in the Western Hemisphere.** xiv and 225 pp. Ills., index. J. B. Lippincott Co., Philadelphia, 1914. 9 x 6.

Both pleasure and information may be derived from this book. It describes the ntire régime of the beaver's work. When beavers consider the water supply of their tream inadequate to their needs they divert other streams into the one that is iminishing by digging ditches to carry the water and by tapping springs by means f small ditches. Their dams vary in length from a few inches to 2,000 feet or more, n height up to 14 feet, and contain up to several hundred tons of material. Subidiary dams, built below the main dam, are from a few feet to several hundred feet part. Their purpose is to back the water against the principal dam, thus supporting t; and in winter, the ice formed between the dams reinforces the main dam against he pressure of the ice, snow, and water acting on its upstream side.

The life history of a beaver colony is given. The author says that "the debt we we to the beaver is of such magnitude that it can never be repaid." Many hundreds f thousands of acres of the finest cultivated land owe their existence to beaver-ponds. hese ponds furthermore prevent floods.

Methods for the protection of the beaver are considered, and it is urged that strict aws be enacted and enforced. Mr. Dugmore says: "If only the schools taught more bout the usefulness of animals and birds, even from the selfish point of view of their esults to men, and taught these things intelligently, much good would come." Suggestions for keeping the beaver in parks are given.

The photographs are a fine feature of the book and are supplemented by sections nd diagrams.

Wilbur Greeley Burroughs.

Harper, R. M. **Some Correlations Between Vegetation and Soils, Indicated by Census Statistics.** *Science*, No. 1084, Vol. 42, 1915, Oct. 8, pp. 500-503.

Tillett, B. C. **The Evolution of the Sheep.** *Ottawa Naturalist*, Vol. 29, 1915, No. 8, pp. 90-93.

HUMAN GEOGRAPHY

Anthropology and Ethnology

Wirth, Albrecht. **Rasse und Volk.** vi and 353 pp. Max Niemener, Halle, 1914. 6½ x 9½.

An essentially popular disquisition upon a theme which cannot fail to interest those who study ethnology on a plane somewhat below that of scientific investigation. The author enriches his theme with abundant enthusiasm and a wide range of illustrative examples. The date of publication makes it clear that he has been able to discuss the problems of Pan-Germanism and Pan-Slavism as academic questions quite removed from need of immediate settlement through practical agencies. In the same detached way he presents the theme of anti-Semitism and adds thereto an interesting chapter devoted to the question of a possibly Aryan origin of Christ as a Galilean. In general, while disputing the value of philology in determining race affinities, he makes much use of the philology of place-names. This is a new weapon in the hands of European ethnologists; probably in time its use will become precise, but at present its technique is little established. In his disquisition on amber, a substance which occupies a critical position in the social anthropology of Europe, he identifies amber and electron as stems from the same root and then, following a grimmer law than is yet accepted in philology, proceeds to hang both nectar and ambrosia on the same stem.

William Churchill.

Fehlinger, H. **Bastardierung beim Menschen.** *Die Naturwissenschaften*, Vol. 3, 1915, No. 41, pp. 524-526. Berlin.

Anthropogeography

Howe, F. C. **The Modern City and Its Problems.** x and 390 pp. Index. Charle Scribner's Sons, New York, 1915. $1.50. 8 x 5½.

The "city at work," particularly the American city, is here presented. The boo inspires confidence in the reader who considers carefully the problems which the autho discusses.

"The city is the counter on which the wealth of the world is displayed; it is th clearing-house to which the most inaccessible quarters of the earth contribute." Comparisons of the ancient city with the modern develop the fact that "the life of th modern city is essentially industrial and commercial, the life of the ancient city wa essentially military and political." "The nineteenth century city is almost exclusivel an industrial product."

The author is cautious in his comparisons of American and European cities, for h respects the differences in age, in the understandings of the peoples of years ago an today, differences in traditions and experiences, and finally the contrasts in the relativ rates of growth of the respective countries in which the cities are situated. For th economic and commercial geographer, a goodly amount of material is available, no only relative to the city but also to the peoples of both Europe and America. A fairl comprehensive bibliography of about one hundred and fifty titles, subdivided into fiftee parts, is appended. Eugene Van Cleef.

Fischer, E. **Der Mensch als geologischer Faktor.** *Zeitschr. der Deutschen Geo Gesell.: A. Abhandl.*, Vol. 67, 1915, No. 2, pp. 106-148. Berlin.

Schmidt, W. **Über Witterung und Befinden des Menschen.** Diagrs. *Meteoro Zeitschr.*, Vol. 32, 1915, No. 9, pp. 395-403.

Economic Geography

Hansen, N. **Funkentelegraphische Weltnetzprojekte.** *Weltwirtschaft,* Vol. 1915, No. 7, pp. 136-138. Berlin.

Russell, E. J. **Soil Protozoa and Soil Bacteria.** *Proc. Roy. Soc.: Series B,* N 610, Vol. 89, 1915, pp. 76-82.

Smetham, Alfred. **Potash: Its Distribution, Commercial Sources, and Agr cultural Value.** 28 pp. Reprinted from the *Journ. Royal Lancashire Agric. Soc.*, 191 Preston. 6d.

Smith, J. W. **The Effect of Weather upon the Yield of Potatoes.** Diagr *Monthly Weather Rev.*, Vol. 43, 1915, No. 5, pp. 222-236.

Thiessen, A. H. **Story of the Thermometer and Its Uses in Agriculture.** Il *Yearbook Dept. of Agric. 1914*, pp. 157-166. Washington, D. C., 1915.

HISTORY OF GEOGRAPHY AND EXPLORATION

Dreyer, A. **Julius v. Payer.** *Mitt. Deutschen u. Österreich. Alpenvereins,* N 17-18, 1915, pp. 184-187.

Hennig, R. **Zur Ophir- und Atlantis-Frage.** *Deutsche Geogr. Blätter,* Vol. 3 1915, No. 3-4, pp. 46-55. Bremen.

Langenbeck, R. **Emil Rudolph.** *Geogr. Zeitschr.*, Vol. 21, 1915, No. 9, pp. 48 483.

Markham, Sir C. R. **The History of the Gradual Development of the Groun work of Geographical Science.** *Geogr. Journ.*, Vol. 46, 1915, No. 3, pp. 173-188.

Termier, P. **Sketch of the Life of Eduard Suess (1831-1914).** *Ann. Re Smithson. Inst. 1914*, pp. 709-718. Washington, D. C.

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THE DESCENT OF THE RIO GY-PARANÁ

By LEO E. MILLER
American Museum of Natural History
Member of Colonel Roosevelt's South American Expedition

It will be remembered that the Roosevelt-Rondon Expedition contemplated a division of work. The main party planned to explore the Dúvida, while a second party was to descend the Juruena and the Tapajoz, and a third party, of which the writer was a member, was to go down the Gy-Paraná. We had looked forward in eager anticipation to the end of the long ride across the Brazilian *chapadão* and the beginning of river work, but now that, thirty-seven days since leaving the upper Paraguay, the goal had been reached without serious mishap, the division of the expedition seemed to come all too soon.

To better organize the two different forces, our party had halted at a point called Sete de Setembro, ten kilometers this side of the Rio da Dúvida, while the other division had pushed on to the point of embarkation. We reached their camp early February 27, 1914, just as the tents were being taken down and the canoes loaded, preparatory to the plunge into the unknown. A short time later everything was in readiness, and farewells were exchanged with Colonel Roosevelt and with the Brazilian officers. Then, with a parting "good luck," their dugouts swung into the current and were whisked away. For several minutes we stood upon the fragile structure that bridged the unexplored river and stared at the dark forest that shut our erstwhile leader and his Brazilian companions from view; and then, filled with misgivings as to whether or not we should ever see them again, we turned our thoughts to the task before us.

Our party consisted of Captain Amilcar de Magalhães, a remarkably skilful and wholly tireless leader, and Lieutenant Joaquim de Melho, of the Brazilian Army, Dr. Euzebio Paulo de Oliveira, a geologist, and Senhor Henrique Heinisch, a taxidermist, of the Brazilian telegraphic commission, besides myself; then there were some thirty-odd *camaradas,* or native assistants. We had a very large pack train of mules and oxen, as that wing of the expedition in charge of Captain Amilcar which had hitherto traveled ahead of the main party was to proceed with us from this point. Our plan was to continue overland to the headwaters of the Gy-Paraná and to descend that stream to the Madeira, taking observations as we went, for, in common with many of the rivers of the South American continent, the course of this stream has not been accurately mapped.[1] Zoölogically speaking, we were in a most interesting and almost unknown country, and no opportunity could be lost to add to our already large and constantly growing collection of both mammals and birds.

We left the Dúvida (now Rio Theodoro) shortly before noon; but it had rained nearly the entire day and the trail was indescribably bad; besides, the animals had completed their thirty-eighth day of travel without proper food or rest. That night we camped beside the trail on a site cleared for the purpose by the *camaradas;* we had taken only the canvas flies, as it had been found necessary to abandon the wall tents some little distance back on account of their great weight. There was no feed for the animals, but the men had cut a quantity of palm leaves growing abundantly in the forest, which the oxen refused to eat, however.

The trail had now left the open *chapadão* and wound between high walls of dark forest; instead of the monotonous level of the plain, the country was now broken and hilly, with numerous small streams trickling through the dividing ravines, and it rained almost continuously; if we had succeeded in evading the rainy season heretofore, it descended on us now with doubled vigor.

A very wide swath had been cut through the forest for the telegraph line to protect the wires from falling trunks and branches; so recent had been the work that the shriveled leaves still clung to the prostrate trees, and the thick second-growth, which springs up immediately where the sunlight is permitted to reach the ground, was just sprouting. The ground was covered with fruits of many kinds, most of them insipid or of acrid flavor, but the herds of peccaries seemed to relish them; and the flocks of parrots and macaws quarreled noisily overhead in their struggles to reach some particularly appetizing morsel. One of the things that especially attracted our attention was the great number of hard, cannonball-like shells that littered the trail; they were the empty casques of the *castanha,* or Brazil nut, which grew abundantly throughout the forest. The Indians had opened most of them, in what manner I am unable to say, as they are so hard the blows of a hammer fail to make any impression, and extracted the dozen or more triangular nuts from each. The trees upon which they

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[1] The Gy-Paraná had been descended by two parties which Colonel Rondon detached for this purpose from his main expedition of 1909. The first, under the zoölogist Alipio de Mirando Ribeiro, went down the Pimenta Bueno and the Gy-Paraná to the Madeira; the second, under Lieut. Antonio Pyrineus de Souza, descended the Jarú and the Gy-Paraná (see map, Fig. 1). It was the reconnaissance survey made by the first party that established the fact that the Gy-Paraná, instead of flowing northwest throughout its course, as until then supposed, turns abruptly north in 11½° S. lat. and flows in this direction for nearly three degrees, until, at another abrupt bend in 9° S., it turns west and empties into the Madeira.—EDIT. NOTE.

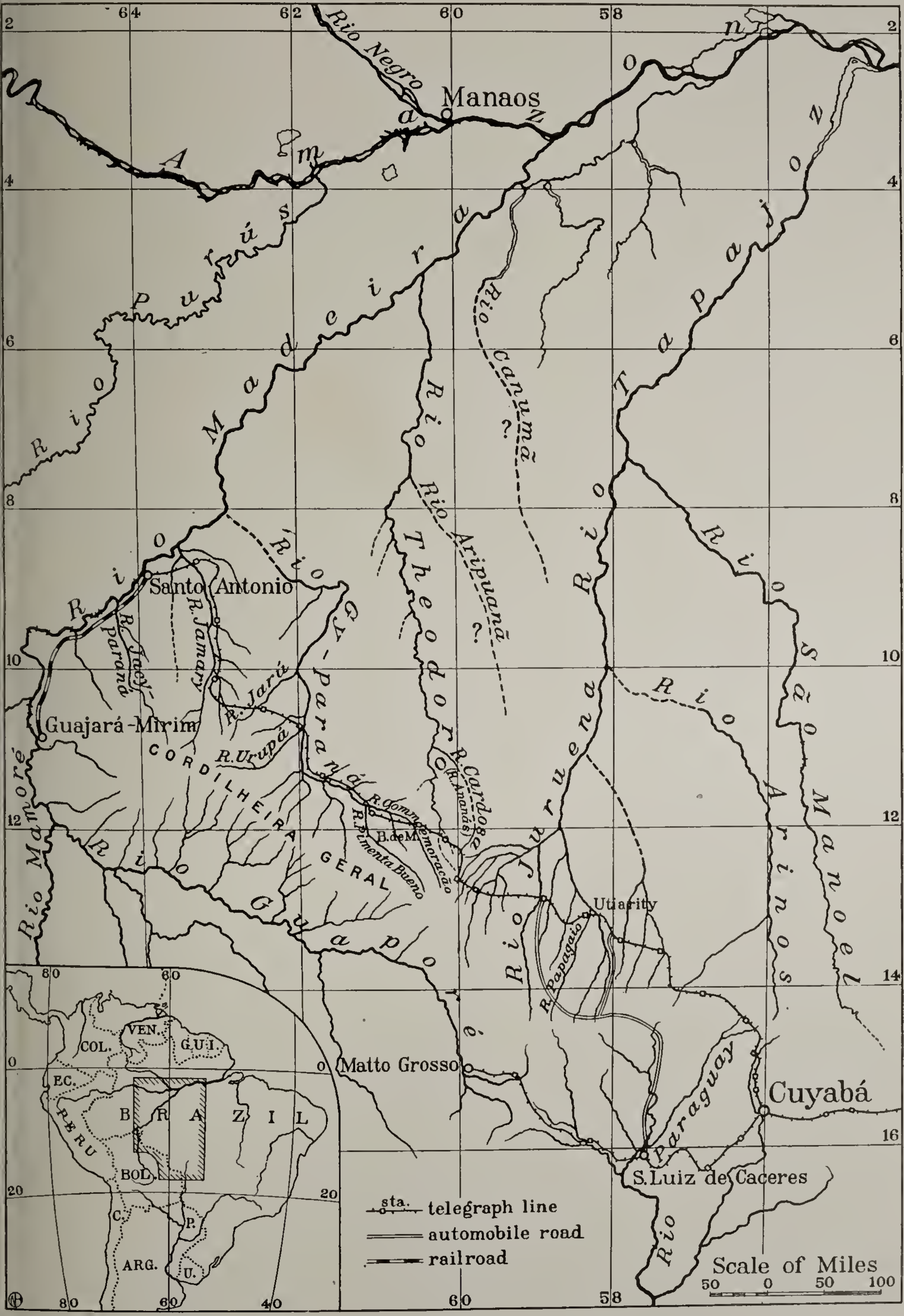

Fig. 1—Sketch map of the south-central part of the Amazon drainage system. Scale, 1:12,000,000. The party of which the writer was a member, after leaving the main body of the Roosevelt-Rondon Expedition, descended the Rio Commemoracão and the Gy-Paraná to the Madeira. From here Manáos on the Amazon was reached by the regular steamer route down the Madeira.

The drainage between the upper Paraguay and the Madeira is based on the surveys of the Brazilian Telegraph Commission, so far as available. Note the recently explored course of the Rio Ananás (*The Geogr. Rev.*, Jan., 1916, p. 50, and Feb., pp. 143-144) and the completed telegraph line from Cuyabá to Santo Antonio (*Bull. Amer. Geogr. Soc.*, Sept., 1915, p. 693). The latter is taken from a map in the Rio de Janeiro newspaper *A Noite* for October 25, 1915.—Edit. Note.

grow are remarkable for their height and great thickness; not infrequently we saw one a hundred and fifty feet high and four feet in diameter without a single branch lower than sixty or seventy feet. Graves were numerous by the wayside; I counted fifteen, near one another, each newly made mound being marked by a rude cross without name or inscription; they indicated the burial sites of *camaradas,* victims to the dread beri-beri and malaria.

During our second night's camp we heard the gruff, cough-like roar of a jaguar not far away, and next morning the men reported that the creature had killed one of the oxen. I went to see the slain animal and found that it was badly bitten about the neck and that one of the thighs had been partly eaten; in its enfeebled state the ox had supplied an easy kill for the big spotted cat. We made no attempt to follow the jaguar but shouldered our guns and started on the home stretch of the long journey. Again it rained heavily, though intermittently, and frequently the mud was knee-deep; but the knowledge that the river and rest lay but thirteen kilometers away acted as a stimulus to the men, and even the weary animals responded to the ceaseless urging of their drivers and panted along as if they, too understood that the end of their toil was at hand.

At about four o'clock that afternoon our destination was reached From the top of a rather high hill we had an unobstructed view down the wide, newly cleared lane through the forest; a small cluster of mud-walled palm-thatched huts nestled in the depression at the foot of the hill, with a patch of corn and rice growing to one side; a hundred yards beyond sparkled the river, and on all sides of the little clearing rose the Amazonian forest. The little building housing the telegraphic equipment was placed at our disposal, and tents were erected for the *camaradas,* who straggled in until a late hour with the foot-sore pack train. The animals were given their liberty and bountiful feeds of corn and fodder, so that within a week many of them were in condition to start on the back trail, a comparatively easy trip, as there were no heavy loads to carry. Many of the natives were also sent back, while others were retained in the service of the expedition one detachment was sent to the camp of the laborers who were working on the telegraph line, which extended two kilometers beyond. This was the end of the survey, Barão de Melgaço being the name of the last station, and a force of about fifty men were engaged cutting the opening for the continuation of the line. At the rate they were working it was estimated that the line to Manáos would be completed in about two years.[2]

We had expected to find a craft of some kind awaiting us so that we might immediately pursue our journey down the river, but in this we were disappointed, although, as it later developed, a boat was then on its way to us, sent by order of Colonel Rondon. There were only two small dug-outs available, which were entirely inadequate for our purpose, so the men vere put to work cutting down a tree of large size and hollowing out a anoe which would hold the party and the necessary luggage. This work ve estimated would take some weeks, so in the meantime we busied ourelves exploring the country in the vicinity of Barão de Melgaço.

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[2] The line was completed by the end of 1914. See "Completion of Colonel Rondon's Explorations in Matto Grosso," *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 693.—Edit. Note.

A short reconnaissance through the forest revealed a veritable zoölogical vonderland. I was consequently very glad that we were delayed, as this ave me an opportunity to study the fauna of a zoölogically unknown egion and to work on some of the problems of nature with which we are onstantly confronted but of which so little is known. One of the facts hat no field naturalist can fail to have thrust upon his notice is the exact recision and nicety with which the balance in nature is preserved. Take he familiar example of the oyster. In its early stages of development, it s subject to the raids of such a host of enemies and adverse conditions that ut of a million eggs only a few bivalves reach maturity; to offset this vholesale destruction, nature has provided that a single oyster may lay everal millions of eggs, and thus the race is preserved. Birds, to a less xtent, are subject to this same thoughtful provision; therefore, we find hat the species which are subject to many dangers during the nesting eriod and which undertake long, perilous seasonal migrations, lay comaratively large sets of eggs; this is best evidenced by ducks, geese, and wans. Species which are subject to the natural dangers of migration only nd are protected during the nesting season, comparatively speaking, rear mall broods of young; warblers, thrushes, and a number of our own native irds would come in this category; to further offset the loss, some of these atter may even rear two broods in a season. When we reach the tropics a narked change is noticeable; the extremes in climatic conditions are usually epresented by the wet and dry seasons; there are few enemies and food is bundant, consequently the loss of life is comparatively small. If reprouction proceeded there at the same rate as in the northern lands, it must e obvious that the country would soon be overstocked; but again, it has een decreed that the equity should be preserved, and the great majority f tropical birds nest but once a year, and then the full complement of eggs s but two. Of course, there are a number of exceptions on each side, and n such matters it is difficult to generalize, but, in the majority of cases, his will be found to be true.

On one of my walks in the forest I came upon a troop of peculiar little nonkeys of the saki family, feeding in the top of a tall wild-fig tree. They iffered from all other known members of the genus by being entirely lack, with snow-white noses., While feeding they were quiet, and the only hing that betrayed their presence was the constant pattering of small articles of fruit upon the dry leaves carpeting the ground. Presently hey took fright, and away they went in a series of leaps and bounds, so that he tree tops were agitated as by a violent gust of wind; they uttered queer ittle whining squeaks as they ran and soon disappeared from view. A small

one of the same species which I owned was a most amusing little pet and never failed to gain a place in the affections of anyone who beheld it—even he most calloused *camarada;* it was of a most playful and friendly disposition and, if petted, made the most ridiculous faces and bubbled with aughter. Another monkey that was common in the forest was a species of *Ateles,* or spider monkey, which is very appropriately named on account of its slender build and long, wiry arms and legs; it also is of a black color, and swings its way through the branches much after the order of a gibbon, although it lacks the latter's agility. The Indians are very fond of this species, both for food and as pets; but whatever epicurean merits may attach to the flesh, in appearance the creatures are most repulsive. The face is pinched and drawn, with a long-suffering expression about the eyes, while a tuft of long, stiff hair extending over the forehead like a ragged cap gives it a greater look of misery and grotesqueness. One specimen which I collected measured six feet two inches from the tips of the fingers to the tip of the tail.

Birds were not uncommon but rather hard to observe on account of the density of the vegetation. Near the river stretched a wide band of bamboo, beautiful to look upon but impossible to penetrate without the aid of a machete. Just beyond, the trees grew tall and in close proximity, giant *castanhas, Heveas,* and ironwoods intermingling their branches to form a canopy of deepest green, impervious to sunlight and through which rain filtered slowly; palms, ferns, and thorny shrubbery formed a dense undergrowth, so that progress at best was slow. From all sides came the clear, ringing *"hoo-whee-whee-hoo"* of the gold bird, or whistling *cotinga,* often misnamed the bell-bird; and although the sound came from but a few feet overhead, it was usually impossible to locate the dull, slate-colored songster perched motionless on a well-screened branch. The smaller species of birds traveled in large flocks, doubtless deriving some mutual benefit from this mode of living; usually the band was preceded by a few scouting brown woodhewers, some with slender bills four inches long bent in a half circle, flitting silently from trunk to trunk, lighting low down and running up rapidly, while they searched the crevices in the bark for insects; then came the vast host of vireos, warblers, flycatchers, tanagers, and woodpeckers, completely investing the trees in their all-absorbing quest of a livelihood. Twigs snapped, seeds dropped, the woods seemed full of fluttering wings and chirping voices; but in a few moments the noise grew faint and stopped; the tireless army had gone its way, and the vanguard of trogons, resplendent creatures with blood-red breasts and metallic green backs, suddenly appeared, hovered in mid-air to snap off an enticing fruit, and then hurried away. Occasionally we were fortunate enough to shoot a curassow, a large turkey-like bird, and then our Brazilian chef prepared the national dish called *canja;* it consists of a fowl and rice boiled together and is delicious.

Work on the dug-out progressed slowly, on account of its large size; a section of the trunk, some thirty feet long, had been cut off where the tree had fallen, and this was being hollowed out with adzes, while short-handled axes were used in dressing down the exterior. After twelve days of continuous hewing the dugout began to assume the appearance of a seaworthy craft, and we figured that she would be ready to launch at the end of another two weeks; but the next day a *batelão* arrived. Her captain had been fighting his way up the Gy-Paraná over three months in his efforts to reach Barão de Melgaço, having been sent from the Madeira by order of Colonel Rondon.

We loaded our meager outfit into the *batelão,* which was a good-sized craft built of boards nailed over heavy wooden ribs, and with a squared tree-trunk for a keel; an arched palm-leaf roof covered a section in the center, under which we sat to avoid the rain or sun. This style of boat is in general use on the larger tropical rivers and corresponds with the *piragua* of the Orinoco and the *champan* of the Magdalena. A crew of eighteen men was mustered, all of whom were more than willing to leave their pestilential environs, and we were soon shooting downstream with the rapid current. Captain Amilcar had gone on ahead with the small canoes in order to survey the river. They carried a sighting rod with red discs and a telemeter for measuring distances; a compass gave them the direction.

A quarter of an hour after starting we reached the camp of the telegraphic commission and made a short stop to take aboard a number of men who were suffering with fever and beri-beri; shattered wrecks of humanity whose only hope of life lay in flight. I saw a number of the *camaradas* who had come across Matto Grosso with us, and it was surprising to note the great change which only two weeks in the steaming, insect-infested forest had wrought; several of them were already suffering from violent attacks of malaria, and their faces were colorless and sallow; others who had been in the region longer stared at the *batelão* with sunken, lustreless eyes in which not even a vestige of interest in our visit or of hope was evident; a few had apparently reached the stage where the sight of the twelve newly made mounds on the hill-top no longer aroused feelings of dread or apprehension but rather of indifference tempered with longing for a welcome release.

The Commemoração, the headwater branch of the Gy-Paraná on which we were, is a deep river from three hundred to a thousand feet wide, with reddish water and a swift current. It was not necessary for the men to ply the oars except when rounding some short bend where steerageway was required, and this was fortunate, as it rained so much of the time that the men were glad to seek the protection offered by the covered portion of the boat. In the intervals between the deluging showers the sun blazed down mercilessly; trees on both sides of the narrow lane of water sparkled as if bedecked with jewels. In places the forest rose from the river's edge in sheer walls of variegated green; tree-trunks, brush, and palms united into one solid battlement by mosses, climbing lilies, and ensnaring creepers. Again, clumps of graceful ita-palms leaned far out over the water and then rose in a series of stately, feather-crowned columns. At frequent intervals we had glimpses of the animal life that lurked within the impenetrable barrier of the forest fastness. Monkeys were especially plentiful, and within an hour after starting we had seen four distinct species, representing as many families; there were files of howlers, the males jet black, while the females are of a straw color, moving leisurely through the branches; troops of dainty squirrel-monkeys, with deep chestnut backs and grayish heads and white faces, scampered over the tops of the lower trees. Black spider-monkeys sat in the highest crotches and gazed down at us in stupid perplexity; and once we startled a family of woolly little night-monkeys of a grayish color which had selected a thick clump of overhanging vegetation as their diurnal sleeping place. Large flocks of blue and yellow macaws, flying two by two, crossed the river high overhead, doubtless on their way to some choice feeding-ground. Kingfishers sped away in front of the hurrying *batelão,* and from the depths of the woods came the muffled sound of an ivory-bill's tapping on a hollow trunk.

That night we reached the junction of the rivers Commemoracão and Pimenta Bueno, the latter a stream not less than a thousand yards wide, with a great volume of water. The river formed by the confluence of these two streams is known as the Gy-Paraná. We had covered a distance of eighty kilometers. In ascending, it had taken the *batelão* nineteen days to cover the same stretch of river that we had just descended in one day.

Of course, the surveying canoes could not travel at this rapid pace, so the two parties became separated. In the very beginning Captain Amilcar's party had suffered an accident which came near ending fatally for several of the men in his canoe. Their work necessitated frequent haults, and to bring the dugouts to a stop while racing down stream was no easy task; so they had adopted the method of driving them into the vegetation and then holding on to the branches while a sight was taken with the telemeter. On one of these occasions a fer-de-lance, the most deadly of all South American snakes, fully seven feet long, was shaken from the overhanging brush and fell into the canoe; the panic-stricken crew leaped into the water. Captain Amilcar retained his presence of mind and shot the snake, but in the meantime several of the men had been swept down stream and were on the verge of drowning before he could reach them; the geologist had gone to the bottom, but was rescued and revived with some difficulty; thereafter he traveled with us in the *batelão.*

There were numbers of small alligators in the river, not over four feet long, called *jacaretinga;* later on, we had the cook prepare one, as they were said to be good to eat. The flesh was of a white color, when cooked, and

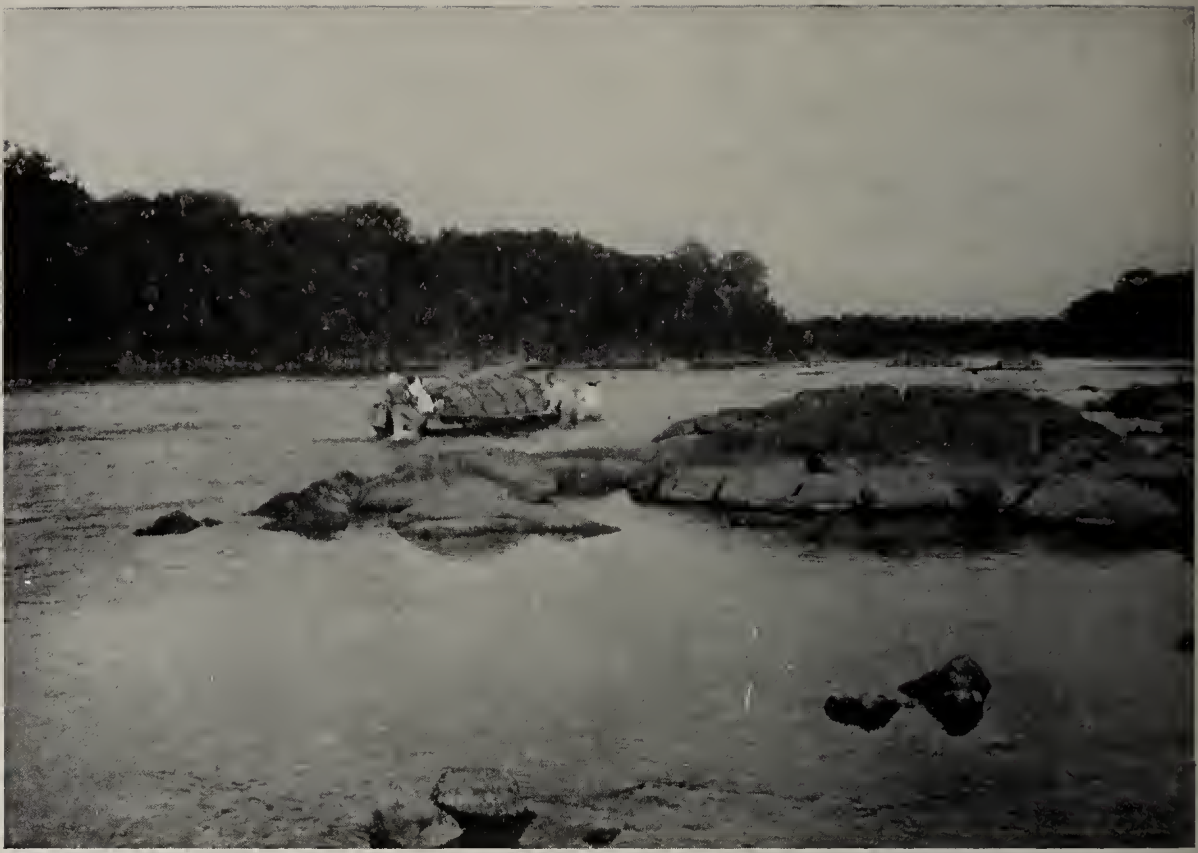

FIG. 3.

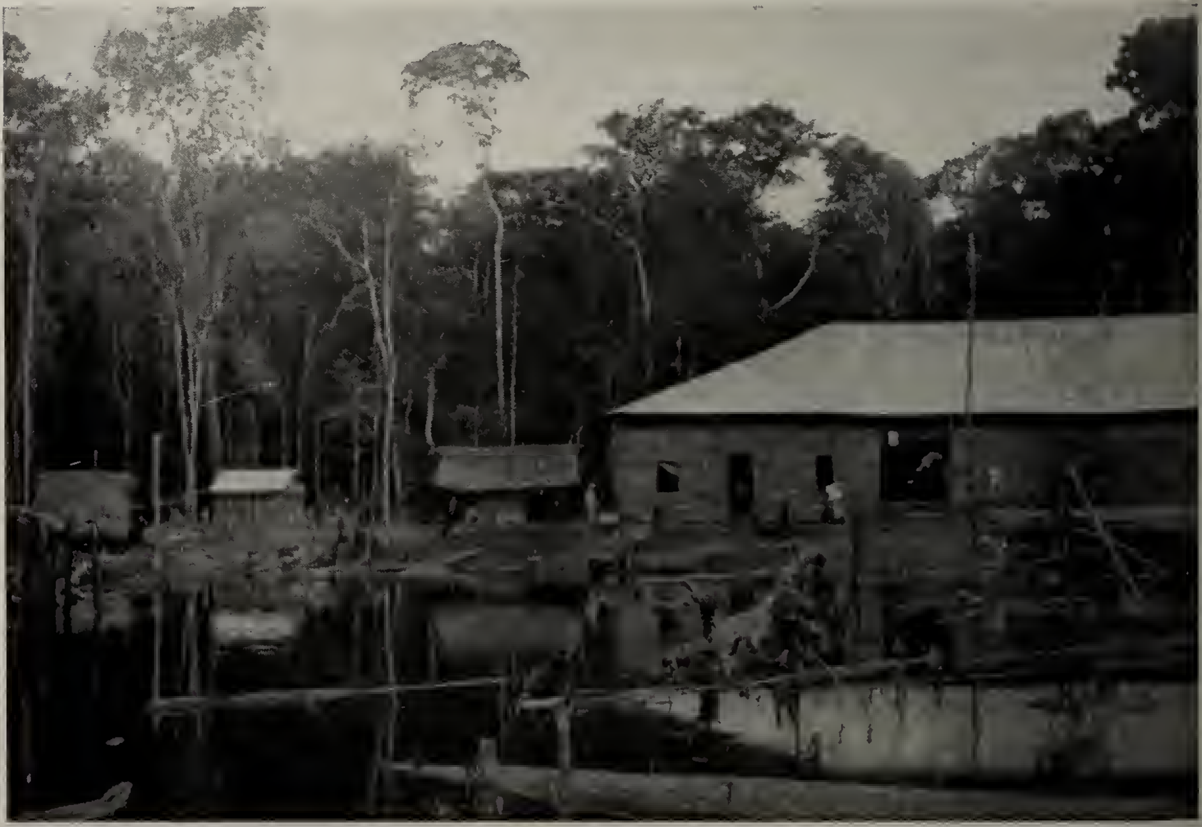

FIG. 4.

FIG. 3—Type of boat used on the tropical rivers and called *batelão* in Brazil and *piragua* in Venezuela. (Photo by Leo E. Miller.)

FIG. 4—São João on the Gy-Paraná during the season of high water. The members of the expedition had to use dugouts in going from one hut to another. (Photo by Leo E. Miller.)

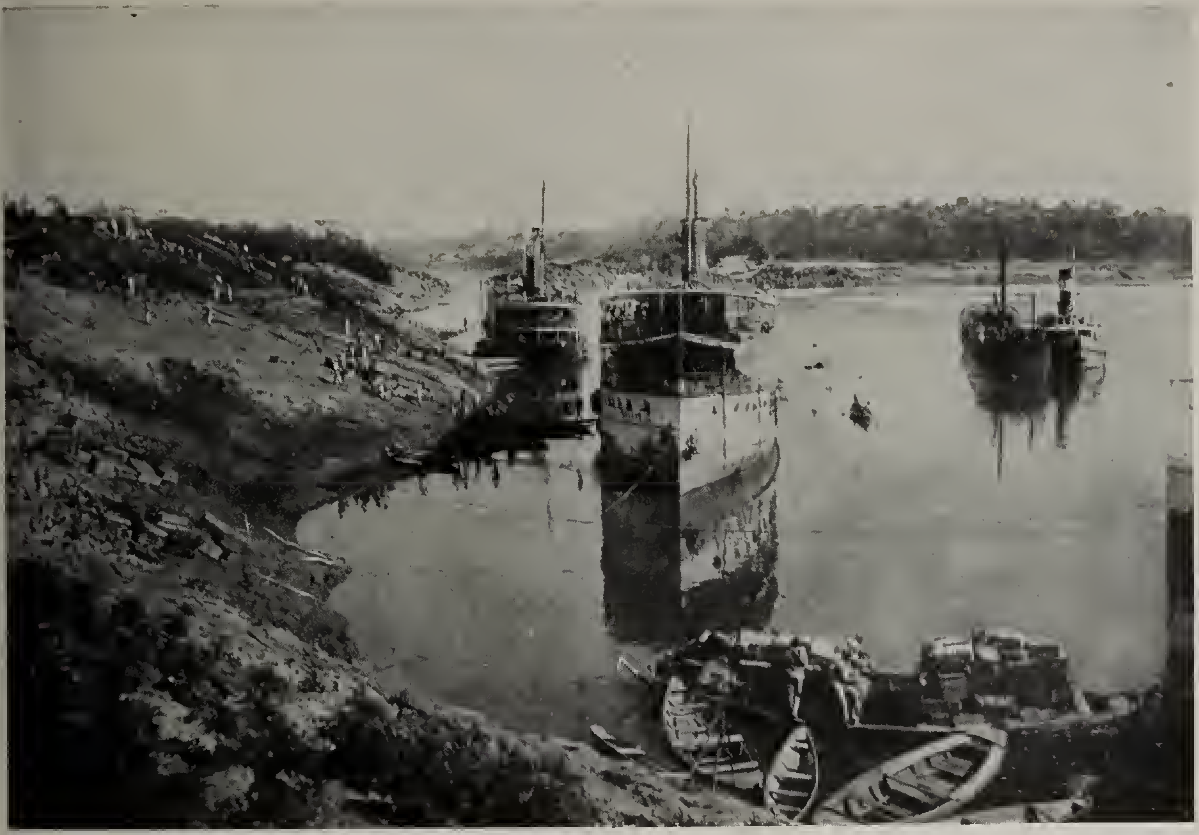

FIG. 5.

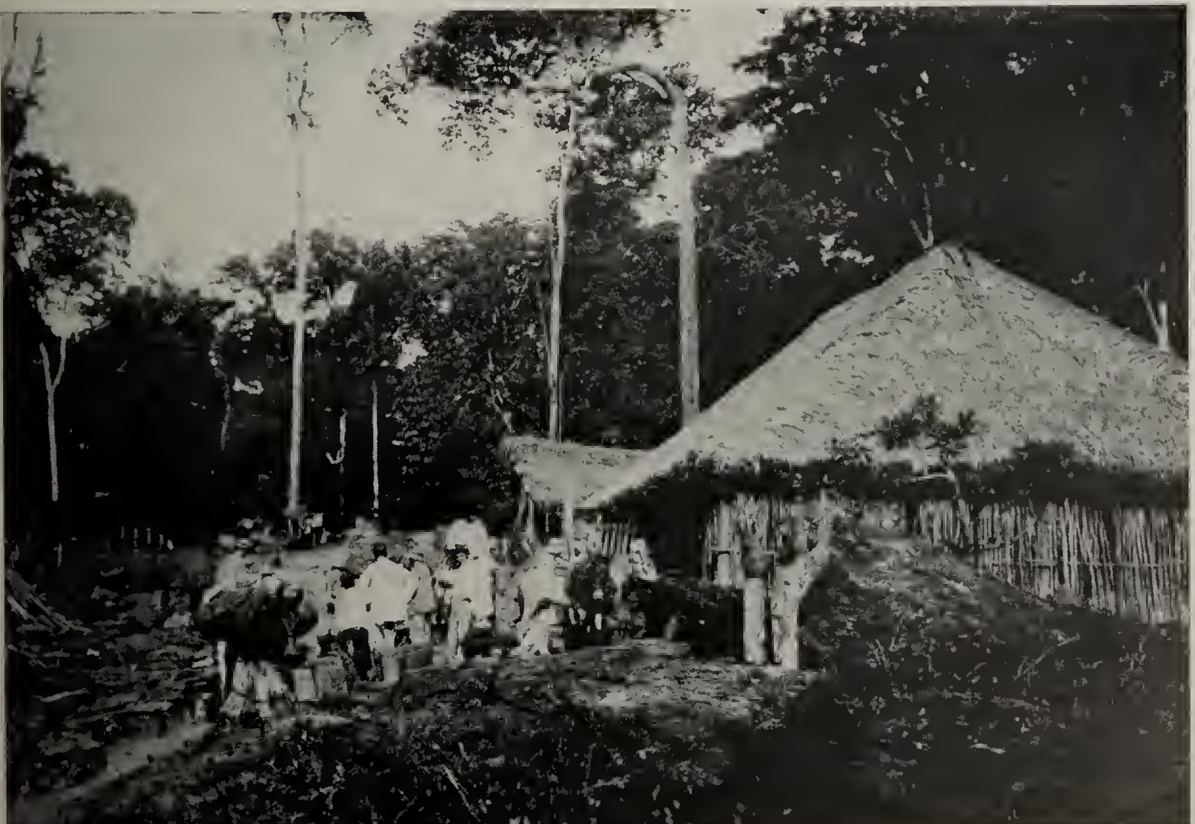

FIG 6.

FIG. 5—The port of Santo Antonio on the Madeira. Ocean-going steamships call here regularly, for, in addition to being on an historic trade route, the town is near Porto Velho, the port at the eastern terminus of the recently completed Madeira-Mamoré railroad. (Photo by Tinba.)

FIG. 6—Rubber spread out to dry, Gy-Paraná. (Photo by Leo E. Miller.)

tender, but it possessed an objectionable, muddy flavor, so that we could eat but little of it; however, the natives liked it.

The next day we covered a distance of one hundred and eight kilometers. The current in the Gy-Paraná is not so strong as in the Commemoracão, but, the weather being fair, the men pulled at the oars steadily during the twelve hours' travel with only short periods for rest and refreshment. All meals were cooked aboard, on a fire built on a box of sand in the prow. Insects were not particularly troublesome, as we kept to the middle of the stream, which, receiving the water of numerous good-sized tributaries, was constantly growing wider. There were abundant signs of the close proximity of Indians on both sides of the river. We saw some palm-leaf lean-tos used for overnight stops, with the charred sticks of a campfire in front; where the water eddied slowly against a crumbling bank, bamboo stakes protruded above the muddy stream—remnants of an ancient fish-trap,—and occasionally we passed a small, cleared spot, now overgrown with rank weeds and second-growth sprouts, which marked the site of an old plantation.

Realizing the importance of the good-will of the wild folk of whose existence in the surrounding forest there was such abundant evidence, the Brazilian government had erected a number of small bamboo and palm-leaf sheds various distances apart, near some of the more recently used trails that led from the water into the dark jungle. Under each rough lean-to a bench, made of long poles laid across sticks driven into the ground, had been built. It was the custom of the officials in going up or down the river to stop at each of these stations and place beads, knives, and trinkets on the benches as a peace-offering to the Indians; but so reticent had been the latter that not one of the articles had hitherto been touched. Great was our surprise and joy to find that all the precious offerings had been removed, and that the Indians themselves had left a number of tokens of friendship in return. There were arrows six feet long, beautifully adorned with the bright-colored feathers of trogons, toucans, and other birds; parcels of Brazil nuts neatly done up in leaves; a few ears of maize, a feather headdress, and a small pottery bowl. We collected all these treasures and left many more presents in exchange.

As we neared one of the last stations, the sound of loud hallooing came from the forest on our right. We swung the great *batelão* toward the shore. We landed, but no sooner had we climbed to the top of the steep bank than we realized how cleverly had been arranged the plan by the Indians to affect a meeting with the mysterious strangers who had invaded their realm. We followed a wide path that led into the dense forest for a distance of twenty yards and suddenly came upon a small, swift stream that sped through a dark tunnel-like opening under the dense canopy of leaves and branches. As we stared in blank amazement into the impenetrable tangle of vegetation on the other side of the stream, there emerged from the forest four nude, bronze figures, gesticulating wildly and chattering in a strange jargon which of course we could not understand; they were of good build, though inferior in physique to the Nhambiquaras we had seen on the *chapadão,* and not over five feet tall, with long, straight hair, and, remarkable though it is, the tangled hair of two of them was of a decided auburn color. Their bodies were plentifully besmeared with dark bluish paint, applied in queer zig-zag designs and giving a grotesque effect. No wilder scene can be imagined than the quartette of naked, trembling creatures faintly outlined against the dim background of merging shadows and somber green; somehow they seemed to fit into the picture and to

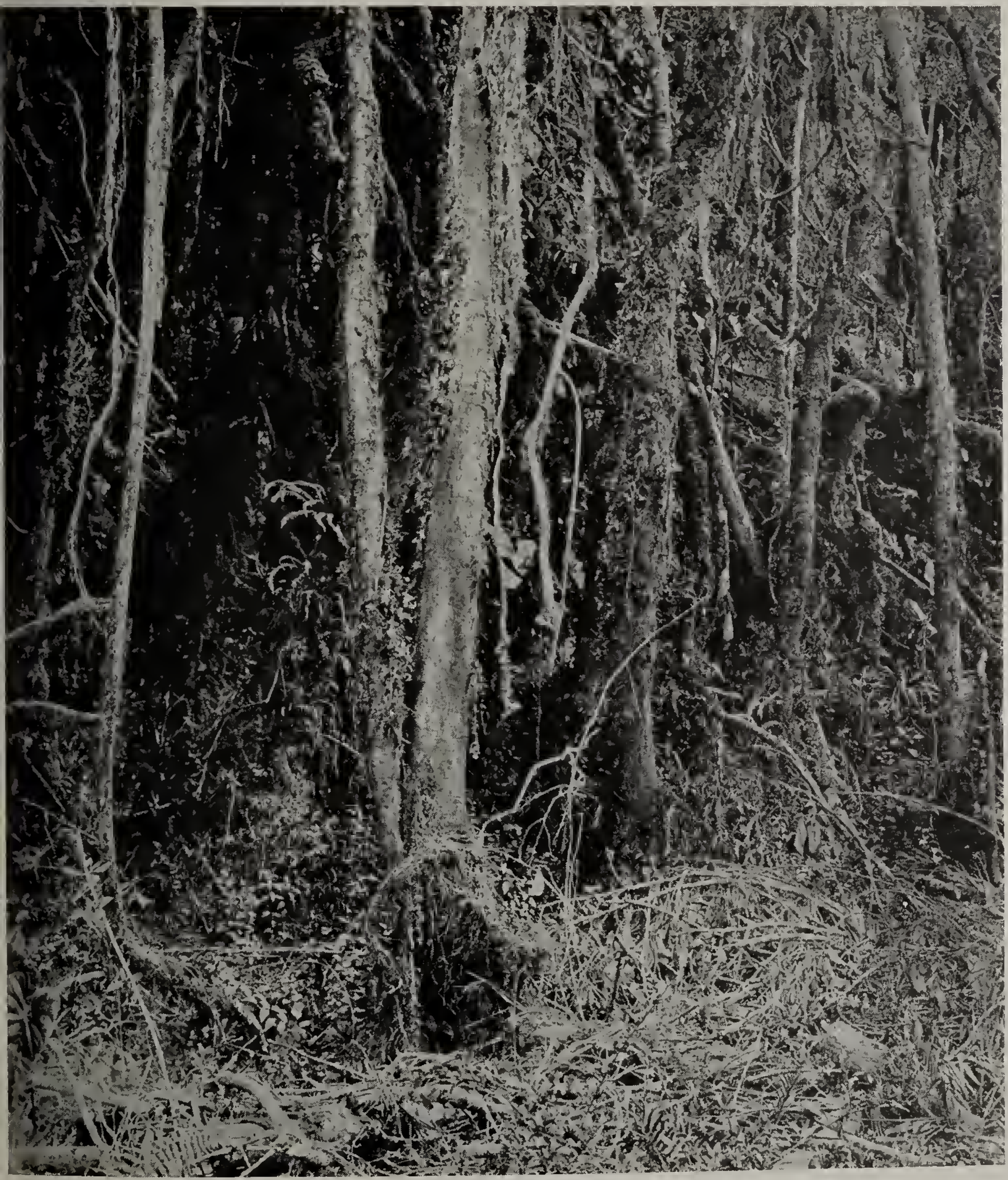

FIG. 7—The dense wall of the tropical forest. (Photo by Leo E. Miller.)

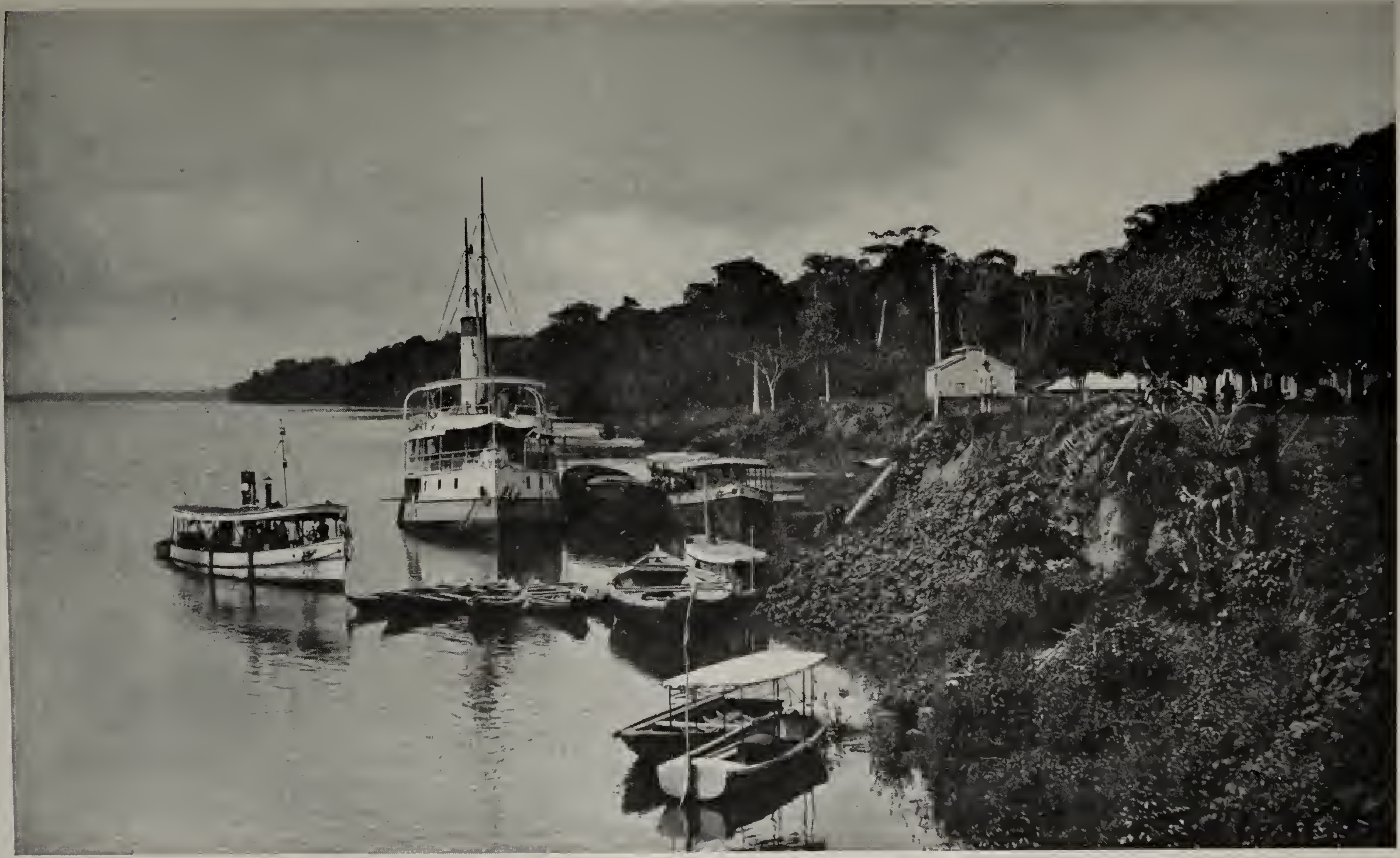

Fig. 9—Calama on the Madeira, the expedition's headquarters during its reconnaissance on that river. (Photo by Tinba.)

complete the impression of primality conveyed by the vast wilderness of the Brazilian hinterland. Our captain had held up bunches of bright red beads and started to wade into the stream towards them, but they immediately withdrew into the thick cover, so he came back. A moment later they reappeared and again began talking and waving their arms; by signs we tried to induce them to come nearer and to assure them of our peaceful intentions. Finally, after a pow-wow with his companions, one of their number approached to the margin of the stream and held out his hands. He then pointed to one of our men and motioned for him to take off his clothes and come over with the presents, which was done; the Indians grabbed the trinkets from the native's outstretched hands, gave him a violent push back and fled to his companions. This was repeated a number of times. Then we refused to permit our man to go farther than the center of the stream—the water was nearly up to his chin—and after lengthy entreaties the Indian waded out and met him half-way. We laid out an attractive assortment of beads, machetes, hatchets, and bright-colored trinkets on our side of the river and, retreating ten or fifteen feet with extended arms, invited the Indians to come over. Slowly they came, apparently with many misgivings. We approached them in a friendly manner; they made no attempt to flee, but cast meaning glances behind them where, obviously, an armed force was concealed nearby to protect them in the event that our actions aroused suspicion. The chief was an intelligent fellow; his first deed was to enact before our eyes a drama that we shall never forget. Assuming a rigid pose, he pointed straight in front of him with one hand, as if taking aim; then with a sudden "pong" he clutched at his breast and fell upon his knees, gradually sinking to the ground, where he lay moaning. We understood the accusation; one of his tribe had been shot to death by our people, probably by a rubber collector farther down the river; that was the reason why they had mistrusted us. We showed them how to use the machetes and hatchets, and they seemed delighted; but when we demonstrated the use of matches their joy knew no bounds; they yelped and danced, made weird grimaces, and tried to set the trees and bushes afire, like so many monkeys. Finally, upon our urgent invitation, the chief shouted a guttural command, and three more savages appeared instantly and joined the group, making seven in all; the late arrivals were also treated in a generous manner, and then we withdrew to our boat. Before leaving, however, we promised to return and bring more machetes and matches, which they seemed particularly to appreciate, and they in turn promised to have the bench in the palm-leaf shed heaped with bows and arrows and other things of their making, promises which were religiously kept on both sides.

Our next halt was forty kilometers farther downstream at a rubber camp known as Urupá. There were several palm-leaf huts standing on a slight elevation, so we took our hammocks and mosquito nets and spent the ight ashore. Traveling eighty kilometers the next day, we reached another ubber camp called La Pena. The surrounding forest was magnificent, and t was said that a footpath led far into the interior to the site of an old ndian village, so I decided to remain at this point a few days to collect. Iowever, a short walk down the trail soon showed that this plan was not easible; the whole forest was inundated to a depth of several feet, and here were so many fallen trees and clumps of thorny undergrowth that unting was out of the question.

The next day we reached Monte Christo, the depot of a large rubber oncern which has its headquarters on the Madeira; about one hundred nen had congregated here to await the coming of the dry season, when hey would begin collecting rubber latex from the *Hevea* trees which bound in the forest. Several long, thatched sheds housed the waiting rowd; hammocks were strung from every available post and rafter, giving he interior a cobwebby appearance, and around the edges of the huts, rotected from the rain by the low, ragged roof of grass and leaves, umerous small fires smouldered over which the men boiled their rations f beans or *farinha.* There were pure blacks, descendants of slaves who ad been imported into Brazil from Africa many years before; also Indians, ortuguese, and men in whose veins flowed the blood of all three of these aces. Many of them were ill with fever, and had large, vile-looking ulcers r ''jungle'' sores, which are said to result from the bite of a small fly. his was not surprising, as the place was entirely surrounded by pools of lack, stagnant water from which clouds of mosquitoes hatched, and no anitary precautions whatever were taken against infection.

The natives are very fond of pets, and numbers of animals taken from he forest while young were enjoying their full liberty but never ventured ar from the houses. There was a collared peccary, full grown and very miable, which liked to be petted, and emitted short, low moans and grunts vhen anyone was near it; three curassows, dignified but restless, spent nuch of their time preening their feathers on a half-submerged log—they vere beautiful creatures of a deep blue-black color with white underparts nd a wonderful curled crest. A pair of trumpeters strutted about the amp; monkeys of the *Cebus* family and parrots of several species climbed bout in the network of hammocks and added their chorus of screams and quawks to the general confusion.

We had to leave the *batelão* at Monte Christo on account of the cataract vhich obstructs the river at this point and carry our luggage around for a listance of half a mile. Below the rapids we found another craft similar o the one we had just left—perhaps a trifle larger—and towed by a small vood-burning launch. On the 18th of March all our things, and the sick nen, several of whom were in a serious condition, were carried aboard the vaiting *batelão,* and the next morning again found us on our way. The y-Paraná was rapidly becoming a vast, muddy sea, comparing favorably in size to some of the larger affluents of the Orinoco, such as the Caura a the Ventuari. The character of the vegetation remained essentially t same, but some of the creepers that drooped from the tall trees and trail in the water were covered with clusters of yellow, pink, and pale bl flowers. We saw and heard little of the animal life, as we traveled too f from the banks. In the afternoon a violent wind-storm blew up the riv accompanied by a terrific down-pour.

Soon after the storm cleared we reached São João, another rubber ca not unlike Monte Christo. The water was so high at this station that had to use a canoe in going from one hut to another, and the whole pla reeked with pestilence. It is infinitely more dangerous to traverse count of this kind than to pass through an entirely uninhabited region; the h are fertile propagators and harborers of contagion of all kinds, to s nothing of the danger to which one is exposed on account of the more less constant mingling with the natives. Just below São João the river again broken by rapids; we rowed down to the beginning of the turbule water in a canoe and then carried around to the foot of the falls. T distance is not great, but we had to cross a high, rocky hill so that we w delayed a day in making this portage. The rapids are called São Feliz a are of a formidable character, as the bed of the river is dotted with hu granite boulders over and among which the water rushes with a roar th can be heard half a mile away. During the dry season these rocks a exposed by the receding water and left covered with a thin scum of m impregnated with salt; it is said that parrots, parrakeets, and macaws th come in thousands to eat of the saline deposit, and that they become so ta great numbers of them are killed with sticks and eaten by the rubb collectors. I saw two macaws nearly three feet in length, and of a bloo red color with blue and golden wings, that had been caught the previo year; they were magnificent creatures, but had the curious habit spending the entire day squatting in a dark hole under the floor of the owner's hut, coming out only when hungry and at night, when they climb to a perch above the door to sleep.

At night our men indulged in a curious native dance which I had nev seen before in South America; they collected a great heap of wood a soon after supper had a roaring bonfire going; then they formed a cir with one man in the center who began to sing in a high, strained voice, a after each line the whole chorus answered with a wail that sounded som thing like *"oh-tee-oh-tee-ah."* The center man bowed and hopped abo on one foot in a most ridiculous manner and made frequent, sudden charg into the surrounding brigade, and if he succeeded in knocking one of the down that man took his place in the middle of the ring. The whole pe formance looked very much like an imitation of a cock-fight. Some of t onlookers had rattles made of small calabashes full of pebbles stuck on short piece of bamboo which they shook in rhythm with the singing; th emed perfectly insatiable of this form of amusement, and the dancing d howling lasted far into the night.

Below São Feliz we found another small launch, towing a *batelão* hich, in the course of a day, took us to a camp called Tabajara. We had ot gone more than a few miles the next morning when further progress as again barred by rapids. After a short walk we crossed a branch of the ver in small dugouts and then started on a two-mile portage through the ooded forest. Another launch was waiting below the rapids, but within venty minutes after weighing anchor we again heard the roar of troubled aters ahead of us; the river raced between high, rock-strewn banks like a rown stream of molten glass. In the distance we could see sinister flecks f white dotting the surface, while a cloud of mist hung like a pall over the iver; but beyond the veil that obstructed our further view came the minous roar of a great cataract, growing in intensity as we drew near. he landing was about a hundred yards above the brink of the first fall, ut the current proved to be too strong for the launch's little engine, and e were in danger of being swept past; the moments that followed were xciting, but fortunately we managed to reach the bank. This same thing ad occurred but a short time before, but the result had been disastrous; he boat was swept over the falls, and, of the thirty-one men aboard, wenty-seven were never seen again. The portage around these rapids, alled São Vicente, was about a mile and a half in length and led over ently undulating country, though all heavily forested. In many places he bed rock had been uncovered by the torrential rains. This consisted f fine-grained, dark granite; naturally there was a shallow layer of sand n the rock, with a thick top covering of rich, black mould. From the top f a high knoll we had a fairly good view of the falls and of the rapids elow; after leaping over a twenty-foot ledge, the river rushes through a arrow rock-filled gorge; enormous boulders tower out of the channel like o many black, unvanquished monarchs. Tongues of spray leap to a eight of forty feet, and clouds of vapor rise in a constant stream. With he exception of the Salto Bello of the Rio Sacre and Utiarity Falls of the apagaio, we had seen nothing to compare with São Vicente during our ntire journey across Brazil.

That night we reached the first settlement, a small village named Doze e Novembro. We arrived tired and wet, for it had rained the greater art of the afternoon, but we congratulated ourselves upon having per-ormed a remarkable day's work.

The place was overrun with ants, not the comparatively harmless *arregadór* ants which are content to carry away your clothing piecemeal hile you sleep, but with endless armies of the fierce, black carnivorous pecies that prey upon every living being. These ants are one of the courges of the tropics; whether in the fever-stricken Chocó on the west oast of Colombia, at the base of Duida on the Orinoco, or in the wilds of

Matto Grosso, the ravaging hordes seemed always the same. One momen
they hurry along in solid formations, the next, side-lines have been throw
out in all directions covering many square yards of ground. Not one lea
or crevice escapes the alert scouting parties, which ascend even to the to
of the tallest tree. When a victim is discovered the news in some my
terious way is flashed to the main column, and battalions of reinforcemen
immediately rush to the encounter, charging the prey and clinging wit
vise-like mandibles to any part of its body that offers a hold. Usually th
approach of the devastating host is preceded by a swarm of panic-stricke
insects, crawling, hopping, and flying in their endeavors to escape destru
tion; large, hairy tarantulas crawl to the tops of bushes and leap fro
leaf to leaf only to be discovered and routed, until in despair they sprin
to the ground, which by this time is one surging mass of ants, where the
are despatched in short order. I have seen scorpions, and centipedes eigh
inches long, suffer a similar fate; no living thing seems to escape th
avalanche of destruction. Flocks of ant-birds usually follow in the wak
of the army, feeding upon the ants and upon the insects that have bee
driven from their hiding places. One of the questions that naturally aris
in this connection is how the callow young of birds escape from the ant
as caged birds are not immune from their attacks, and dead or wounde
birds placed near the army's line of march are quickly discovered, torn
shreds, and carried away. While in British Guiana, I had been watchin
the nest of an ant wren containing two helpless young, placed in th
crotch of a tree a few feet above the ground, for several days; one mornin
the whole region was swarming with ants and the nest was empty; ho
ever, not long after, and also on subsequent days, both parent birds we
seen contentedly carrying food into a thicket fifty yards away. A casu
search failed to reveal the new nest, but to my mind there was no dou
that the young birds had been removed upon the approach of danger; o
of the adults was marked in a peculiar manner so that there was no mi
take in the identity of the pair. Doubtless this was an exceptional cas
and in the vast majority of instances young birds perish in common wi
the other creatures which are overwhelmed by the ants.

On the day following our arrival at the little village, we boarded
waiting launch sent from the Madeira to meet us—the *Jayme,* she w
called—and started on the final stretch down the stream; within an ho
we reached the boundary line of Matto Grosso and entered the great sta
of Amazonas. The Gy-Paraná had assumed the proportions of a migh
river; it is doubtless one of the largest, if not the longest affluent of t
Madeira, and frequently the distance between banks was not less tha
half a league. The water was yellow and there was little current; fr
quently we ran into drifts of floating trees, branches, and patches of gra
that had been washed out of the flooded areas. There was no opening
the tall, tropical forest which stretched into the distance and disappear

ı one long, unbroken vista of deepest green. Toward evening we reached he mouth of the Gy-Paraná, and entered the vast muddy expanse of the Iadeira; we crossed to the other side and landed at a small port called 'alama, the home of Senhor Asensi, owner of the rubber camps we had assed on the last days of our journey down the river. Senhor Asensi very ourteously placed his comfortable home at our disposal and suggested hat we remain as his guests until we had in some measure recuperated rom our rather trying experiences, and we were glad to accept his hos- itality. Practically every member of the party had suffered from frequent nd severe attacks of fever, although half a gram of quinine had been aken by each one daily, and some of the *camaradas* were so ill that they ad to be carried ashore; the latter were sent to Manáos for medical treat- ıent on the first available steamer. I was particularly eager to spend ome time at Calama, as the locality appeared to offer unusual opportunities or zoölogical work. After a few days of thorough rest the Brazilian ıembers of the party started up river to Santo Antonio, for a tour of the Iadeira-Mamoré railroad, while I remained to investigate the fauna of the egion.

The country back of Calama is high and undulating, so that it remains ntouched by the water that covers the lowlands during the wet season. A mall space which had been cleared around the building was covered by a ne growth of grass and low bushes and served as pasture for a few head f cattle; small birds, such as flycatchers, grass finches, and tanagers eemed in the opening, and many short-tailed, green parrots squawked in he tree-tops at the edge of the forest. A short distance below the landing ıere was an extensive swamp and many small brush-covered islands; ıasses of aquatic plants floated in the quiet, open pools, conspicuous among 'hich was the beautiful *Victoria regia* with leaves four feet in diameter. n the dense tangled vegetation that grew out of the black depths of the ıurky swamp water we found flocks of *hoatzins,* or lizard-birds, curious rchaic creatures which retain some of the characteristics of their reptilian ncestors; they are about the size of a pheasant, of an olive color above and ellowish below; a high crest crowns the head, and they possess only a mited power of flight. It was the height of the nesting season, and many f the fragile platforms of sticks contained two or three yellowish eggs, eavily spotted with reddish-brown; the wings of the young are provided 'ith long, sharp claws which enable them to climb about over the branches ke lizards, hence their name.

All traveling through the swamp had to be done in a canoe; and pushing ıe dugout through the almost solid mass of branches and creepers was a ifficult task. Every twig seemed to swarm with small red ants, called fire- nts, on account of the intense burning sensation produced by their bites, nd they were constantly dropping upon us in scores. Several times we lundered into *maribundi* nests, and in each instance the outraged wasps promptly retaliated. Large *iguanas* jumped out of the trees into the wat with a loud splash as we passed underneath, and troops of woolly monke deserted the wild cashew trees in which they fed and beat a hasty retrea The swamp was full of life, but we rarely recovered anything we shot; t caymans and *piranhas* with which the water was infested usually snappe up our specimens before we could reach them. At night we set throw-lin and caught the great *pacu,* a fish of the *piranha* family; but unlike its bloo thirsty relative it prefers a vegetable diet. A *pirarucú,* six feet long an weighing two hundred and fifty pounds, was also taken; this is the large fish that inhabits Amazonian waters; the scales are an inch and a half i diameter and of a silvery color, those of the latter half of the body bein margined with deep scarlet.

The forest back of Calama contained about as much game as is ev found in one spot in South America. There were deer, agoutis, and pe caries, but it was impossible to penetrate far into the interior on account the Parintintin Indians, who make this region their stronghold. Thes Indians have always maintained a hostile attitude toward the settlers. A attack was made on Calama one day at noon just as luncheon was bein served; from out of dead silence of mid-day there suddenly came a show of arrows; this was promptly answered by rifle-shots from the house, an the Indians immediately fled. Thirty bamboo arrows were gathered u many of them five feet tall, with barbs on each side of the head; some the shafts were wrapped with hair and skin taken from the victims previous raids.

The Parintintins are of medium stature and well built; they are fr quently at war with their near neighbors, the Mundrucus; when hostiliti are in progress, which is nearly always, the front of the head is shave leaving only a round spot of short hair no larger than a silver half doll in the center; the hair on the back of the head remains long.

The Mundrucus have the curious custom of preserving the heads of t Parintintins slain in battle; one of these I subsequently saw, prepar somewhat in the same manner as those formerly so highly prized by t head-hunters of Ecuador. Apparently the head had been smoked, and t eyes had been replaced with balls of pitch; it was a weird trophy, suggesti of wild orgies and cannibalistic rites performed in the depths of the jung by the light of flickering pitch torches, and to the music of wailing ree and deep-voiced tom-toms.

Captain Amilcar reached Calama about a week after our arrival. had suffered a second accident, in which his canoe, all his personal effec the instruments and practically all of his scientific data had been lo These incidents emphasize the uncertainty of travel and exploration on t great South American waterways, and the dangers to which everyone constantly subjected who ventures beyond the beaten paths of steamshi and tourists' routes.

On April 7, the *Fortaleza,* a good-sized steamer plying between Manáos and Santo Antonio, called at Calama on her downstream journey, and we embarked for the last stage of our journey. We made excellent time, stopping only at long intervals for the purpose of taking aboard Brazil nuts. On the 9th of April we entered the Amazon, and the next morning found us steaming up the Rio Negro with Manáos visible in the distance. It had been fifty-two days since the division of the expedition at the River of Doubt.

CLIMATIC VARIATIONS AND ECONOMIC CYCLES

By ELLSWORTH HUNTINGTON, Ph.D.

Since the publication of Brückner's widely known book on "Climatic Changes Since 1700"[1] there has been a strong and growing tendency to treat climate as a dynamic instead of a static geographical force. Because of its recurrent and, as yet, unpredictable variations it continually produces new and unforeseen results, whereas the static forces act uniformly, although man's power to utilize or overcome them may increase. This new conception bids fair to produce widespread effects not only upon geography, but also in the realms of history and economics on the one hand and of general biology on the other. Two admirable examples of the new tendency are afforded by the recent essays of Pettersson,[2] the director of the Swedish Hydrographic-Biological Commission, and of Moore,[3] professor of political economy at Columbia University. Pettersson treats of present climatic cycles as illustrated in the fisheries of the Baltic Sea, and of past cycles of greater amplitude as illustrated by the history of Greenland, Iceland, and Scandinavia during the period of climatic stress which culminated in the fourteenth century. Moore treats of the cycles of our own day and points out their dominating effect upon the march of prices and hence upon the economic currents of the United States.

To begin with Moore's work, since it lies closest to our own lives, he belongs to what we may call the geographical school of economists, who believe that the products of the soil are the ultimate foundation of the world's economic structure. He argues, as do all geographers, that since the productivity of the soil varies greatly from year to year for climatic reasons, especially because of changes in rainfall, climate must be one of the vital economic forces. He does not stop with the mere statement of his belief, however, as many geographers have done, but tests it by the most rigid mathematical methods. He selects the Ohio Valley and Illinois as two typical regions of great agricultural wealth where an intensive study of rainfall is likely to prove illuminating. His first object is to determine the periodicity of the rainfall, which he does by means of harmonic analysis based on Schuster's methods. He finds a very highly developed 8-year period and a less prominent 33-year period. On the basis of these two cycles and of their "semi-harmonics," or half periods, he reconstructs a "harmonic" rainfall curve. The next step is to examine the relation of crops to rainfall. He selects for this purpose the corn, oats, hay, and potatoes of Illinois, which together form over 96 per cent of the value of the crops of that state. By means of correlation coefficients he finds that the critical periods are as follows:

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[1] Eduard Brückner: Klimaschwankungen seit 1700, nebst Beobachtungen über die Klimaschwankungen der Diluvialzeit. 324 pp. Diagrs. *Geogr. Abhandlungen*, Vol. 4, No. 2. Vienna, 1890.

[2] O. Pettersson: Climatic Variations in Historic and Prehistoric Time. 26 pp. Maps, diagrs., ills. Reprint from *Svenska Hydrogr.-Biol. Komm. Skrifter*, No. 5.

[3] H. L. Moore: Economic Cycles: Their Law and Cause. 149 pp. Diagrs. The Macmillan Co., New York, 1914.

Crop	*Critical Period*	*Correlation Coefficients*
Corn	July, August	.589
Oats	May, June, July	.290
Hay	March, April, May, June	.620
Potatoes	July, August	.666

If temperature as well as rainfall were considered, the coefficients would doubtless be still higher, especially in the case of oats. Even as they stand they are so high as to indicate a very close relation between the size of the crop and the rainfall. Hence Moore constructs harmonic curves of the crops on the basis of the cycles used for rainfall, that is 8 and 33 years, and finds that they are very similar to the rainfall curves. It seems to the writer that the use of harmonic curves is one of several points in the book that deserve criticism because they are given as if they were parts of the main argument, although in reality they are not necessary and weaken rather than strengthen it. The curves add a difficult and somewhat obtrusive mathematical element which detracts from the main thought, and they do not bring out the facts so conclusively as would the actual curves properly smoothed.

In the next chapter Moore discusses the "law of demand." He shows that the staple food crops follow the usually accepted form of this law, namely, that an abundant supply causes a fall of price while a limited supply causes a rise. Within reasonable limits the price of wheat, for example, can be predicted provided the size of the crop is known; and the size of the crop can be predicted if the weather conditions are known. This brings us to the most important part of the book. Taking the whole country, Moore investigates the average yield per acre of nine staple crops, giving to each a weight proportional to its importance. He then demonstrates that, regardless of whether the acreage is larger or smaller, the price fluctuates in proportion to the yield per acre, which in turn varies according to the weather and especially according to the rainfall. The next step is to connect this result with other economic conditions in the realms of manufacturing and distribution.

Before doing this, however, Moore turns aside to another of the matters which seem both unnecessary and inconclusive. Economists have advocated the doctrine that a small supply causes a high price and vice versa, but the conditions prevalent during hard times are thought by Moore to contradict this. When business is at its worst and the supply of manufactured goods is at its least, the prices are lowest; while when times are good and all the factories are producing their maximum output, prices rise highest. It seems to the writer that there is no real contradiction between the commonly accepted economic law and Moore's new interpretation. In the case of crops the *supply* is the determining factor, and the price goes dow when the supply is abundant. In the case of other articles the *demand* i the ruling element; the price goes down when poor crops not only mak the farmer poor but compel the laborer to pay high prices for food, an thus decrease the demand for manufactured goods. It is worth while t emphasize this point because Moore's book is so important that it is sur to be widely criticized, and this is one of the easiest avenues of attack. Ye so far as the fundamental conclusions are concerned the book is so firml grounded on a vast body of facts that its main line of argument seem unassailable. Hence this review attempts to brush aside, as it were, th parts that may arouse criticism, but which are irrelevant to the mai geographical argument.

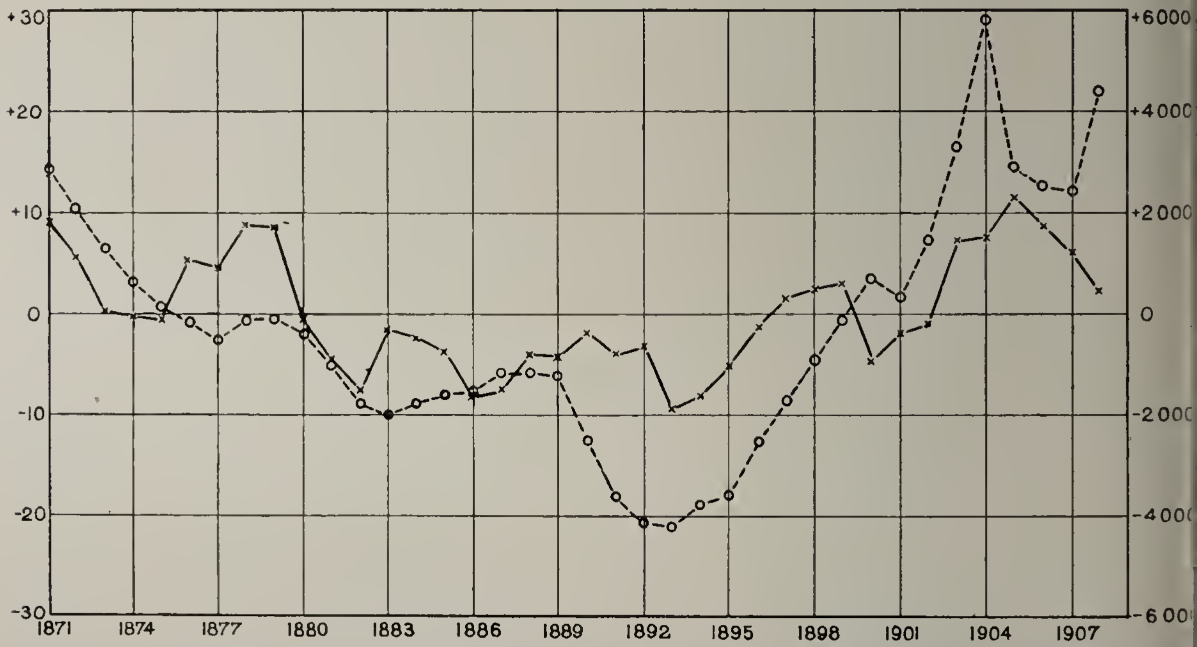

FIG. 1—Relation between cycles of yield per acre of crops (x—x—x) and cycles of the production of pi iron (o---o---o), a lag of two years in the production of pig-iron having been eliminated. (Based o Fig. 23 in Moore's "Economic Cycles.")

The figures on the left and right represent the deviation of the yield of crops per acre and of the pr duction of pig-iron from their respective secular trends.

To return to the outline of the book, a detailed study of pig iron, th ''barometer'' of trade, shows unmistakably that its price goes down whe that of food products goes up, and vice versa. It does not feel the effec of scanty crops immediately, however, for there is a lag of between on and two years. The relationship is illustrated in Figure 1. The last poin considered by Moore is the relation of general prices to crops and henc to weather. By means of the index numbers of ''all commodities'' prepare by Falkner from 1870 to 1890 and by the Bureau of Labor since 1890 h constructs the curve of general prices marked with circles in Figure 2 In this, as in the other curves, the secular change, that is, the effect o the depreciation of gold in the case of general prices and the effect o improved methods of agriculture in the yield of crops, has been eliminated

Also the curve of prices has been pushed back four years so that what appears as 1871 is really 1875. This is legitimate. The production of pig iron is, as it were, the preliminary step in all manufacturing. If it shows a lag of one or two years, a lag of twice as much is to be expected in commodities whose production requires a much greater number of stages between the raw material and the finished products.

Moore's final conclusions may be summed up in his own words: "In the introduction to this essay it was observed that economic dynamics stand in need of a law that shall be to a changing society what the law of diminishing returns is to a society in a relatively static state. We may now formulate the law: The weather conditions represented by the rainfall in the central part of the United States, and probably in other continental areas, pass through cycles of approximately thirty-three years and eight years in duration, causing like cycles in the yield per acre of the crops; these cycles of crops constitute the natural, material current which drags upon its surface the lagging, rhythmically changing values and prices with which the economist is more immediately concerned. . . . The principal contribution of this essay is the discovery of the law and the cause of economic cycles. The rhythm in the activity of economic life, the alternation of buoyant, purposeful expansion with aimless depression, is caused by the rhythm of the yield per acre of the crops; while the rhythm in the production of the crops is, in turn, caused by the cyclical changes in the amount of rainfall. The law of the cycles of rainfall is the law of the cycles of crops and the law of economic cycles."

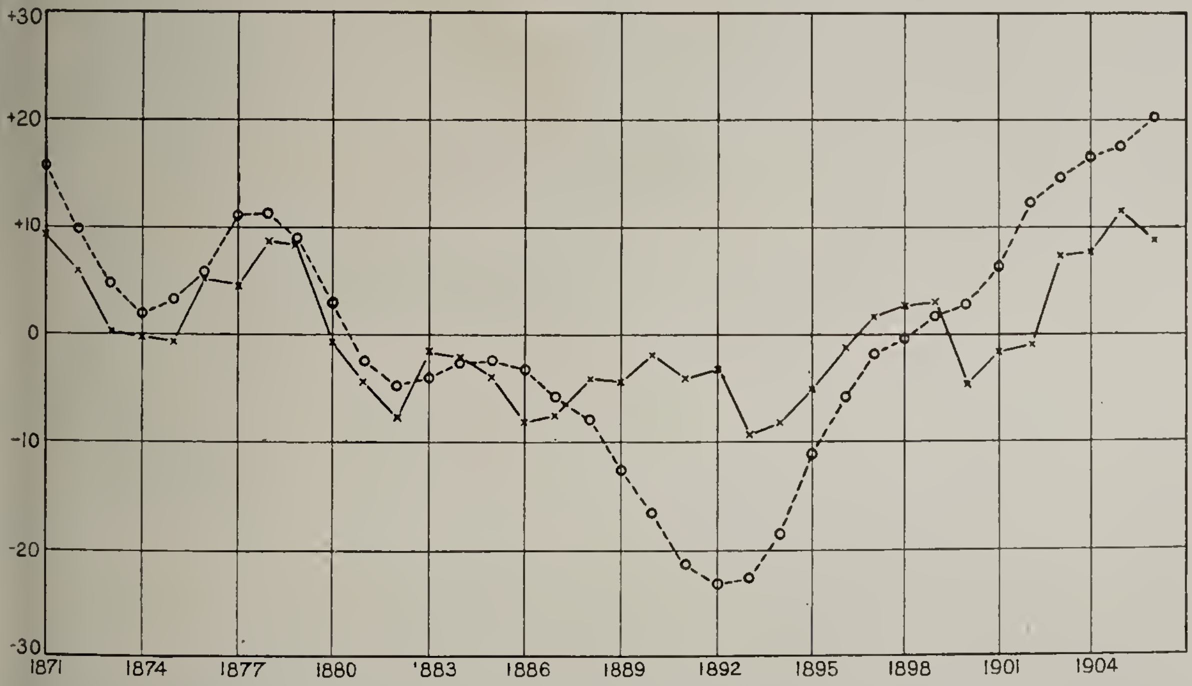

FIG. 2—Relation between cycles of yield per acre of crops (x—x—x) and cycles of general prices (o---o---o), a lag of four years in general prices having been eliminated. (Based on Fig. 27 in Moore's "Economic Cycles.")

The figures on the left represent the deviation of the yield of crops per acre and of the index of general prices from their respective secular trends.

It may be questioned whether Moore is really the discoverer of this law. Clayton[4] announced it in 1901 in his paper on rainfall and commercial crises. Brückner,[5] in his work on the relation of rainfall to immigration and economic distress, has stated it in effect, although not with the definite label of "law." Other geographers have discussed it under other forms, so that it may be regarded as an integral part of current geographical thought. Moore appears to have been so busy in the laborious preparation of his admirable tables that he has failed to find out how much has been done by his predecessors. Yet, after all, such criticism is of minor importance. Moore has gone much farther than his predecessors and has removed his subject from the realm of probability to that of almost absolute certainty. Hereafter there can be little question that apart from such influences as the depreciation in gold, or great calamities like the war, the general trend of economic conditions in this country is closely dependent upon cyclical variations in the weather.

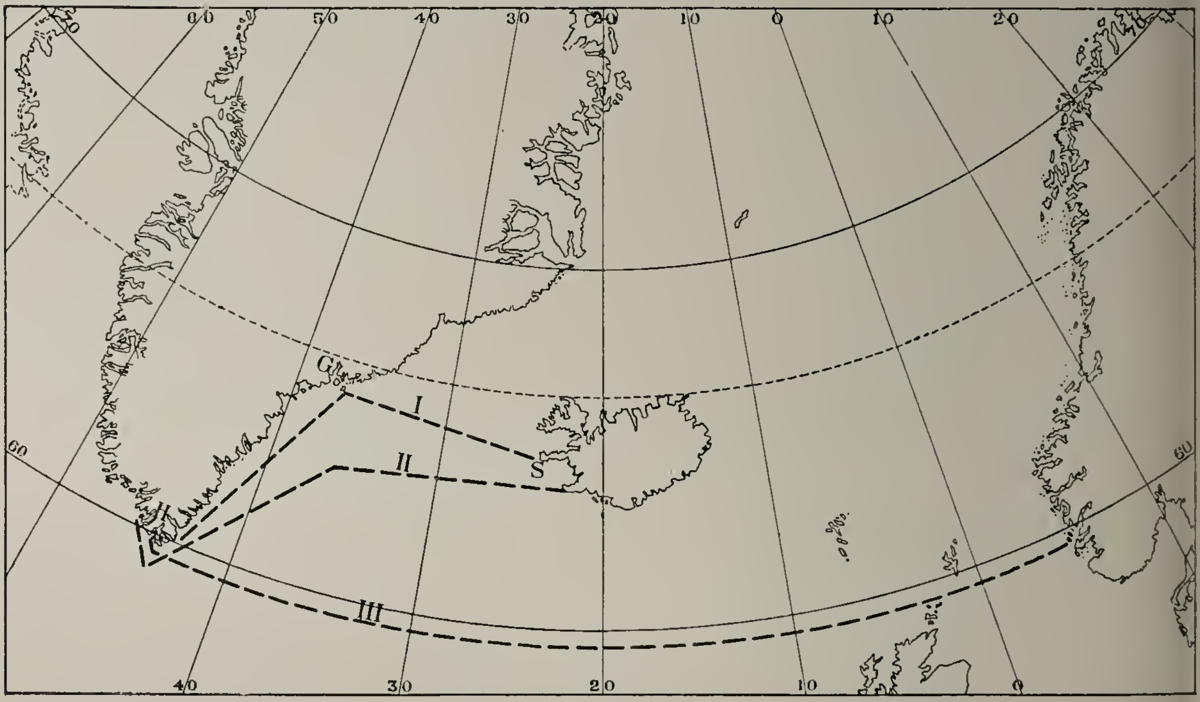

FIG. 3—Old Norse sailing routes to Greenland. (Based on a figure in Pettersson's "Climatic Variations in Historie and Prehistoric Time.")

I, Eric the Red's route on his voyage of discovery, which became the regular route followed from 1000 to 1200; II and III, sailing routes from 1200 to 1400 according to the old sailing directions of Ivar Bårdsson. S, G, H are localities; S, Cape Snæfell on the western coast of Iceland; G, Gunbjörnskær, and H, Hafhverf, on the coast of Greenland.

Turning now to the work of Pettersson, we find the same conclusion under another guise. The period of climatic instability which culminated in the fourteenth century appears to have been to all intents and purposes a phase of a cycle resembling those shown in Moore's curves, but on a much larger scale. It produced correspondingly great results. Pettersson gathers the evidence of this cycle from the level of the Caspian Sea, the conditions of Lop Nor and other parts of Central Asia, the growth of the Big Trees of California, the history of Yucatan, and the records of great storms, disastrous floods, and unprecedentedly cold winters in northwestern Europe. His main discussion, however, relates to Greenland and the Vikings.

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[4] H. H. Clayton: Influence of Rainfall on Commerce and Politics, *Popular Science Monthly*, Vol. 60, 1901, pp. 158-165.

[5] Klimaschwankungen und Völkerwanderungen im XIX. Jahrhundert. 8 pp. *Internat. Wochenschr. für Wiss., Kunst und Technik*, March 5, 1910.

Klimaschwankungen und Völkerwanderung. Vortrag gehalten in der . . . K. Akademie der Wissenschaften am 31. Mai 1912. 24 pp. Vienna, 1912.

The Settlement of the United States as Controlled by Climate and Climatic Oscillations. *Memorial Vol. Transcontinental Excursion of 1912 of Amer. Geogr. Soc.*, pp. 125-139, New York, 1915.

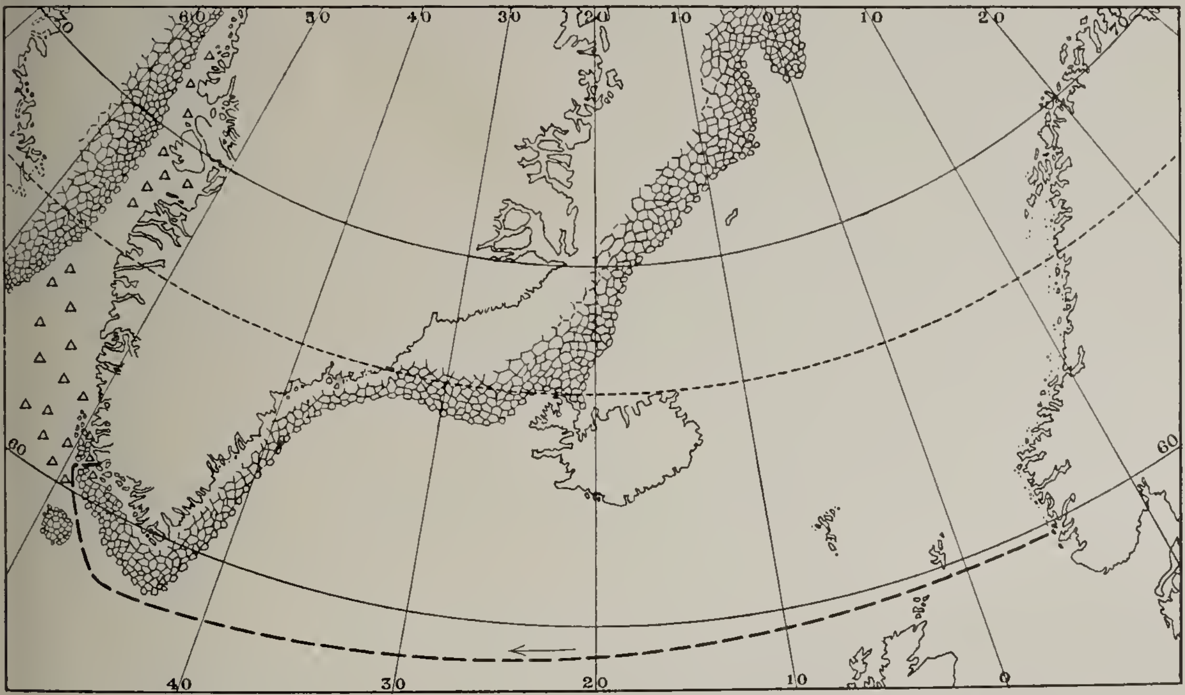

FIG. 4—Present sailing route from Norway to Greenland. (Based on a figure in Pettersson's "Climatic Variations in Historic and Prehistoric Time.") The shaded areas indicate the limit of pack ice and solid drift ice.

When Eric the Red first went from Iceland to Greenland in 982 A. D. he does not seem to have been troubled by ice. The sailing directions preserved in the old sagas show that ships at first went nearly westward from Iceland to the coast of Greenland, then southward along the coast, and through the strait which separates the island of Cape Farewell from the mainland (see Fig. 3). Such a course is now impossible because of the accumulation of floating ice (Fig. 4), yet the earlier sagas make no mention of any such hindrance. In the thirteenth century, however, there appears a warning not to make the east coast of Greenland too soon on account of the ice, while a little later the old course was completely abandoned, and ships dared not try to reach the coast of Greenland except at the southern tip or a little way northward on the west side where ice is still comparatively scarce.

Other facts bear out the conclusions derived from the ice. The sagas speak of abundant fruit of excellent quality in the warmer inner valleys of southern Greenland, and figures are in some cases given as to the numerous cattle. Such fruit will not grow now, and the number of cattle at present is probably not over a hundred, although the population is as great as in the days of the Vikings. There is not sufficient pasturage for more. Another important fact is that ruins of old Norse villages are tucked away in almost inaccessible spots at the base of the glaciers or else in places where the level land is practically covered by ice. The Eskimos say that there are ruins of houses and churches under the ice. All these things point to a marked advance of the inland ice sheet since the days of the Vikings. The worst time seems to have been in the fourteenth century. Ships then found it difficult to reach Greenland, and the colonists were largely left to themselves. The Eskimos, too, who had previously not been troublesome, began to make raids. Pettersson thinks that this was due to the fact that the northern waters where the Eskimo had been accustomed to fish became covered with ice. Therefore economic distress began to render the people discontented and violent, and at length they raided the Norseman in answer to the demands of hunger. One of the main Norse settlements was wiped out in 1342, the other and larger disappeared after 1418.

In explanation of the mechanism of the climatic change culminating in the fourteenth century Pettersson says[6] that in the days of Greenland's prosperity "the powerful Labrador Current carried no ice . . . or, in any case, nothing comparable to the present quantity. This again reacted on the Gulf Stream. It is the drift ice of the Labrador Current which attacks the Gulf Stream south of Newfoundland and compels its warm water to spread eastward towards the submarine base of the Azores and the coastal bank of Europe. There it is joined by the warm outflow from the Mediterranean, which . . . . (extends) as far as the west coast of Ireland and forms the vast area of warm water over which the great low-pressure belt south of Iceland forms in winter. When no ice was carried by the Labrador Current and this current consequently played a less conspicuous part in oceanic circulation, the Gulf Stream 'could take a more westerly course,' as Ekholm says. Then the ice-melting took place in higher latitudes, in Baffin's Bay, in the Arctic Sea, and even in the Polar Basin. Western and northwestern Europe then possessed a more continental climate with colder and calmer winter weather."

In Norway the effect of the stormy climate of the fourteenth century, which succeeded the conditions just described, was almost as disastrous as in Greenland. Dr. Bull of Christiania is quoted by Pettersson[7] to the effect that the decay of the Norwegian kingdom at that time was not so much a consequence of political conditions as of the frequent failures of the harvest, so that grain for bread had to be imported from Lübeck, Rostock, Wismar, and other places. "The Hansa Union undertook the importation and obtained political power by its economic influence. The Norwegian and-owners were forced to lower their rents. The population decreased and became impoverished. The revenue sank 60 to 70 per cent. Even the income from Church property decreased. In 1367 corn was imported from Lübeck to a value of 500,000 kroner. The trade balance inclined to the disadvantage of Norway, whose sole article for export at that time was dried fish. Dr. Bull draws a comparison with the conditions described in the sagas when Nordland [on the Arctic Circle] produced enough corn to feed the inhabitants of the country. In the time of Asbjörn Selsbane the chieftains in Trondenäs [still farther north, in latitude 69°] grew so much corn that they did not need to go south to buy corn unless three successive years of dearth had occurred. The province of Trondhjem exported wheat to Iceland and so on. Probably the turbulent political state of Scandinavia at the end of the Middle Ages was in a great measure due to unfavorable climatic conditions, which lowered the standard of life, and not entirely to misgovernment and political strife, as has hitherto been taken for granted."

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[6] *Op. cit.*, pp. 21-22.

[7] *Op. cit.*, p. 22.

Evidently the economic law here illustrated by Pettersson is the same as that found in America by Moore, but with appropriate modifications, because conditions of abundant rainfall that are favorable in the central United States are unfavorable in Scandinavia and Greenland. If Norway had not suffered such distress she might have been able to succor her colonies across the Atlantic and save them in spite of the Eskimos. If that had happened the history of America would assuredly have been different.

Pettersson's paper is of great value not merely for its discussion of the economic effects of climatic cycles but for its suggestions as to the cause of such cycles. A prolonged series of oceanographic studies has led him to the discovery that variations in tidal intensity, due to the relative position of the moon at perigee and apogee, can be detected in the flow of water into the Kattegat and Baltic as determined by the level at which a certain salinity is found. They can also be detected by means of the migrations of fish, especially herrings. The smallest main cycle lasts eighteen years. In the part of this cycle when the tides are strong and the currents from the Atlantic consequently extend far toward or into the Baltic, the fish move in the same direction. The number of herrings caught off the southwest coast of Sweden is almost invariably at a maximum when the tide-generating forces are at a maximum, but greatly declines when the force is at a minimum,—another striking influence of the control of a dynamic geographical environment over economic conditions.

A study of wider periodicities of the tides shows that the perigee of the moon and the perihelion of the earth coincide in direction once in about 1,800 years, or, specifically, about 3500 B. C., 1900 B. C., 250 B. C., 1433 A. D., and 3300 A. D. At such times, since the tide-raising bodies are nearer to the earth than usual, their combined forces when the moon is at its greatest declination cause unusually high tides. This must cause unusually strong currents into the Kattegat or even the Baltic. That such is the case is indicated by the fact that in the Middle Ages from 1100 to 1500 A. D. a highly prosperous herring fishery existed in the Öresund between Copenhagen and the Swedish shore, while later it moved gradually northward into the northern Kattegat and the North Sea. As further proof of the strength of the tides Pettersson points out the many instances in which the waves overwhelmed the coasts of the Netherlands and of eastern England from the thirteenth to the fifteenth centuries. Apparently the extraordinarily high tides, joined with storms of unusual severity, were the reasons why the Zuyder Zee and other lowland tracts became permanent parts of the North Sea through the breaking down of the barriers of sand dunes that had previously protected them. On our own shores it is probable that similar high tides may account for many of the supposed evidences of an uplifting of the coast.

Thus far Pettersson's reasoning seems convincing. It is not so easy to accept his conclusions when he attributes the sharp climatic change of the fourteenth century to the effect of the tides. He thinks that the tides may have generated currents so strong that they appreciably influenced the distribution of water of various temperatures and thus altered the wind system. For instance, he shows that a larger influx of the dense salt brine of the Atlantic through the Kattegat would diminish the thickness of the light layer of comparatively fresh water which floats on top of the Baltic and forms an outward current at the Kattegat in the opposite direction from the lower current. If the fresher layer were thin, it would become cold throughout its whole mass more quickly than now and hence would be more likely to freeze. In this way a part at least of the recorded freezings of the Baltic during the Middle Ages may perhaps be explained. The tides may also have had much to do with the increased quantity of drift ice along the eastern Greenland shore in the fourteenth century and thus may have had some influence upon the location of the Gulf Stream and of the North Atlantic low-pressure area. It is worth noting that there is considerable evidence that the climatic cycle which reached a maximum in the fourteenth century appears to have been of a much more severe character than the one which caused the trees of California to grow rapidly in the tenth century. To carry this farther, however, and to suppose that tidal changes could radically alter the rainfall of California or of the far interior of Asia seems scarcely probable. Moreover, the periodicity of climatic changes indicated by the trees of California or by the lakes of Central Asia does not harmonize with the periods of the tides. Apparently climatic fluctuations are due to some other cause, which in the Middle Ages chanced to coincide with a tidal maximum.

Even though we may reject Pettersson's broader conclusion as to the effect of tides on climatic cycles, it seems highly probable that he has discovered one of the minor causes, which, like volcanic eruptions, play an important part at certain times and places. Geologists have been prone to think that with the lapse of Croll's hypothesis of the effects of the precession of the equinoxes upon glaciation there remained no important astronomical hypothesis based upon the movements of the earth and sun. Pettersson's work shows that this is by no means the case. His astronomical calculations are unassailable, and he finds definite terrestrial results corresponding to expectations.

In this connection it may not be amiss to call attention to two other astronomical hypotheses which are advocated in recent publications. They fail to receive much consideration because they depend on abstruse calculations upon which only the astronomer can pronounce judgment. One is the theory of Drayson, set forth in a book called "Draysonia" by A. F. R. de Horsey[8] and recently advocated in numerous articles by R. A. Marriott.[9] The gist of this is that unexplained but widely recognized discrepancies in the calculations of the obliquity of the earth's axis are due to the fact that the obliquity actually varies from a minimum of 23° 25′ 47″ to a maximum of 35° 25′ 47″ in a period of 31,682 years. Such a change would have brought the Arctic Circle down to the latitude of northern England about 13,500 B. C., and would unquestionably have produced marked climatic results. The geological as opposed to the astronomical arguments advanced in support of this hypothesis are not convincing. For instance, they pay no attention to glacial stages and other minor climatic cycles such as the one discussed by Pettersson. Nevertheless until astronomers agree as to the cause and extent of the variation in the obliquity of the earth's axis, we cannot say absolutely that this hypothesis is to be discarded.

Another hypothesis of the same kind is that of F. J. B. Cordeiro.[10] He holds that since the earth is acknowledged by physicists to be slightly elastic and not absolutely rigid, it must possess a gyroscopic motion. If this is so, it appears that the obliquity of the earth's axis must be subject to a secular variation of long period. This, Cordeiro holds, would cause the obliquity to vary from zero, at which time a warm climate would prevail at the poles, to an angle greater than that of the present time, which would give rise to glaciation. The movements back and forth must in any case be extremely slow, much slower than those postulated by Drayson. The testing of this hypothesis demands such abstruse calculations that no one but a highly trained mathematician can follow them. Moreover, the variables are so numerous that only the broadest approximations are possible.

The reason for introducing these hypotheses here is that such work as that of Moore and Pettersson is rapidly leading to the conclusion that climatic cycles of all grades are of great importance, not merely in geological times, as has long been recognized, but in human history and in our own personal affairs. Therefore the necessity of understanding their causes is correspondingly urgent. We cannot reach a true solution unless the many possibilities are viewed without bias. The carbonic acid hypothesis, the hypothesis of crustal deformation, the solar hypothesis in its various forms, and the volcanic hypothesis are all before us. The work of Pettersson, together with the other more tentative hypotheses described above, suggests that the purely astronomical hypothesis must also be considered. In its lunar form it offers explanations of small phenomena with cycles varying from 3 to 1,800 years and in its other forms it offers explanation of cycles of 30,000 or more years, and of those of still greater magnitude. Such cycles have apparently existed, whatever may be their cause. Their economic effects upon man, and the corresponding effects upon plants and animals, must have been vital.

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[8] vii and 76 pp. Diagrs. Longmans, Green & Co., New York, 1911.

[9] *E.g.*, Changes of Climate: The Glacial Period Explained, *Candid Quart. Rev.*, 1914, August, pp. 757-782. Letchworth, England.

[10] The Gyroscope. vii and 105 pp. Ills. Spon & Chamberlain, New York, 1913.

ARIDITY AND HUMIDITY MAPS OF THE UNITED STATES

By MARK JEFFERSON

How can we represent simply and clearly what a geographer regards as the essential facts of rainfall—the facts that condition life in the United States? The two accompanying maps are an attempt to answer the question.

The facts of precipitation are taken from the latest rainfall map by Henry Gannett.[1] Gannett's maps of rainfall have always appealed to the writer because they pay attention to mountain contouring and utilize well-ascertained facts about mountain rainfall and vegetation as well as records of rain gages. A rain gage, if properly exposed, may give a good idea of the rainfall of a region after ten or twenty years of observation. Even if badly exposed, as many gages are, it may give some idea of the local precipitation. Likewise a forest in a treeless region hints very definitely at greater rainfall where it stands than roundabout. It is true that a forest cannot tell us how many inches of rain fall in its area, yet if the fall on the treeless lands about it is a little less than some critical amount, as 10 inches, for instance, it would be no indiscretion to draw the isohyet for that value on the mountain. No geographer should hesitate to do so. The meteorologist who declines to do so should entitle his map one of ''average gage readings'' rather than of ''normal precipitation.''

That is precisely what the precipitation charts of the Weather Bureau are. Refer, for example, to that in the ''Statistical Atlas of the United States,'' 1914.[2] The Wasatch Range is there marked 15 inches, plus. All the gages are on the lower ground, of course; the highest at Soldier Summit and Ibapah, both places 7,500 feet above the sea. The summits of the Wasatch rise above 12,000 feet. Of the fifty-seven stations where rain is measured in the state of Utah, twenty-two are below 5,000 feet, nineteen between 5,000 and 6,000 feet, nine between 6,000 and 7,000 feet, and seven

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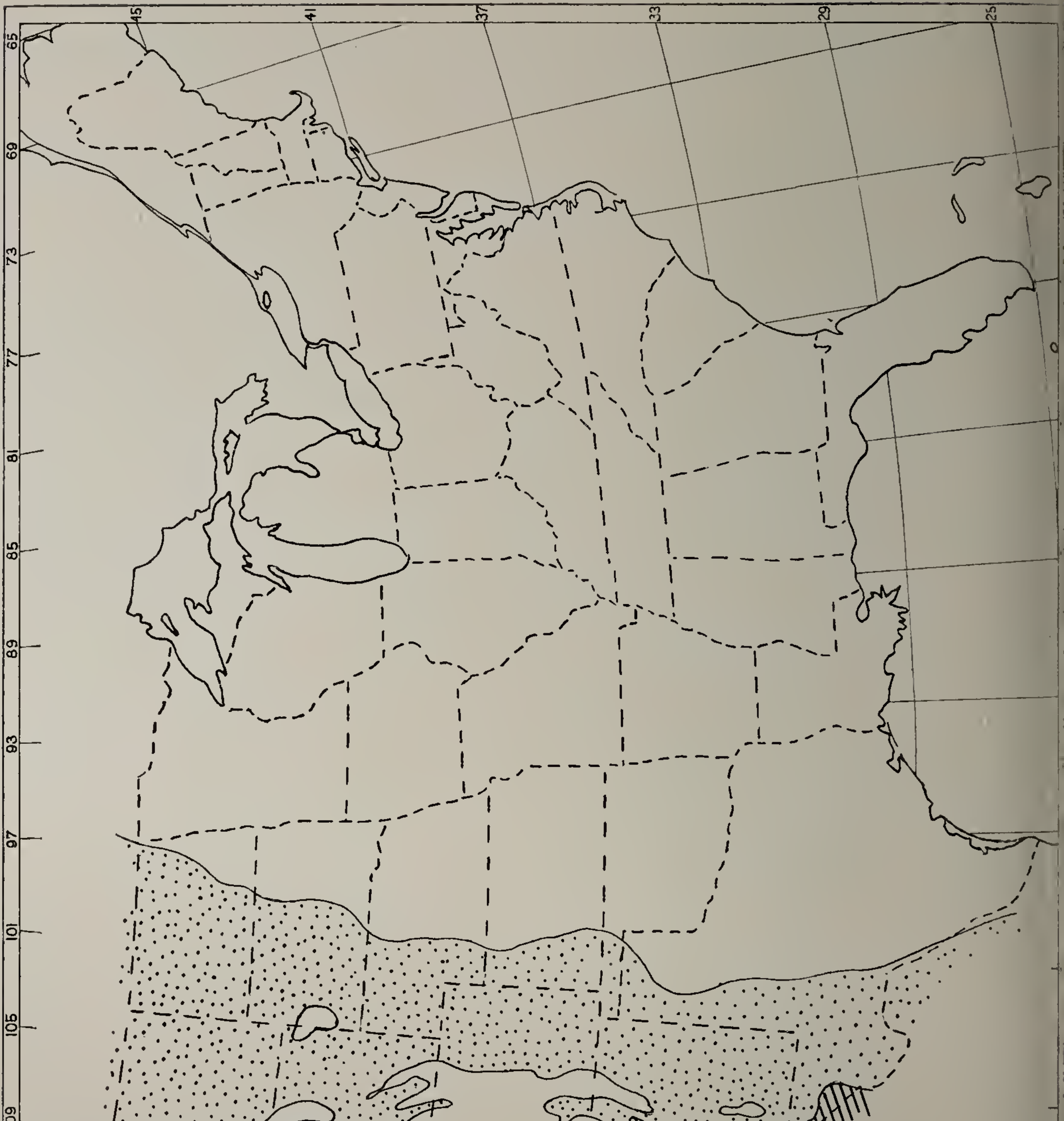
[1] Scale, 1:16,000,000, Pl. I, *U. S. Geol. Surv. Water-Supply Paper 301*, 1912 (also as Pl. I in each number from 302 to 312, 1912-14). The rainfall curves are drawn for every 5 inches in the interior from the Rockies to the Appalachians, and elsewhere for every 10 inches. The numbers on the curves are too small; indeed, some of them are illegible, and the draftsman has been careless in the Adirondacks and Catskills. Either the line numbered 50 inches should be numbered 40 inches, or a 40-inch line should be added.—M. J.

Gannett's earlier rainfall maps of the United States were published as follows: 1:11,900,000, Pl. I, *U. S. Geol. Surv. Water-Supply Paper 234*, 1909; 1:11,900,000, Pl. 40, *Monthly Weather Rev.*, Vol. 30, 1902; 1:29,000,000, Pl. VI, *U. S. Geol. Surv. 14th Ann. Rept.*, Part II, 1894. The 1912 map has rainfall curves only, the others have tints in addition. The 1909 edition was reproduced as a wall map, 1:3,041,280, by A. J. Nystrom & Co., Chicago, in 1915, although the more complete 1912 version was then available. Another reproduction, 1:33,500,000, in metric equivalents, of the 1909 edition, with modifications along the Canadian border, beyond which it is extended, accompanies, as Fig. 1 on p. 390, a paper by Henri Baulig on run-off and erosion in the United States in the *Annales de Géogr.*, Vol. 19, 1910. The 1894 edition is substantially reproduced in about 1:40,000,000 as Fig. 7, *U. S. Geol. Surv. 22nd Ann. Rept.*, Part IV, 1902, and as Fig. 1, *U. S. Geol. Surv. Water-Supply Paper 257*, 1911. On both these reproductions the arid district of the upper Colorado basin in northeastern Arizona and southeastern Utah is by mistake shaded to indicate 20-30 inches rainfall instead of 0-10 inches.—EDIT. NOTE.

[2] Pl. 389, scale, 1:11,900,000, Bureau of the Census, Washington, D. C., 1914. This map has rainfall curves only; for the same map with tints in addition see Pl. XXVI, *U. S. Weather Bur. Bull. Q*, 1906.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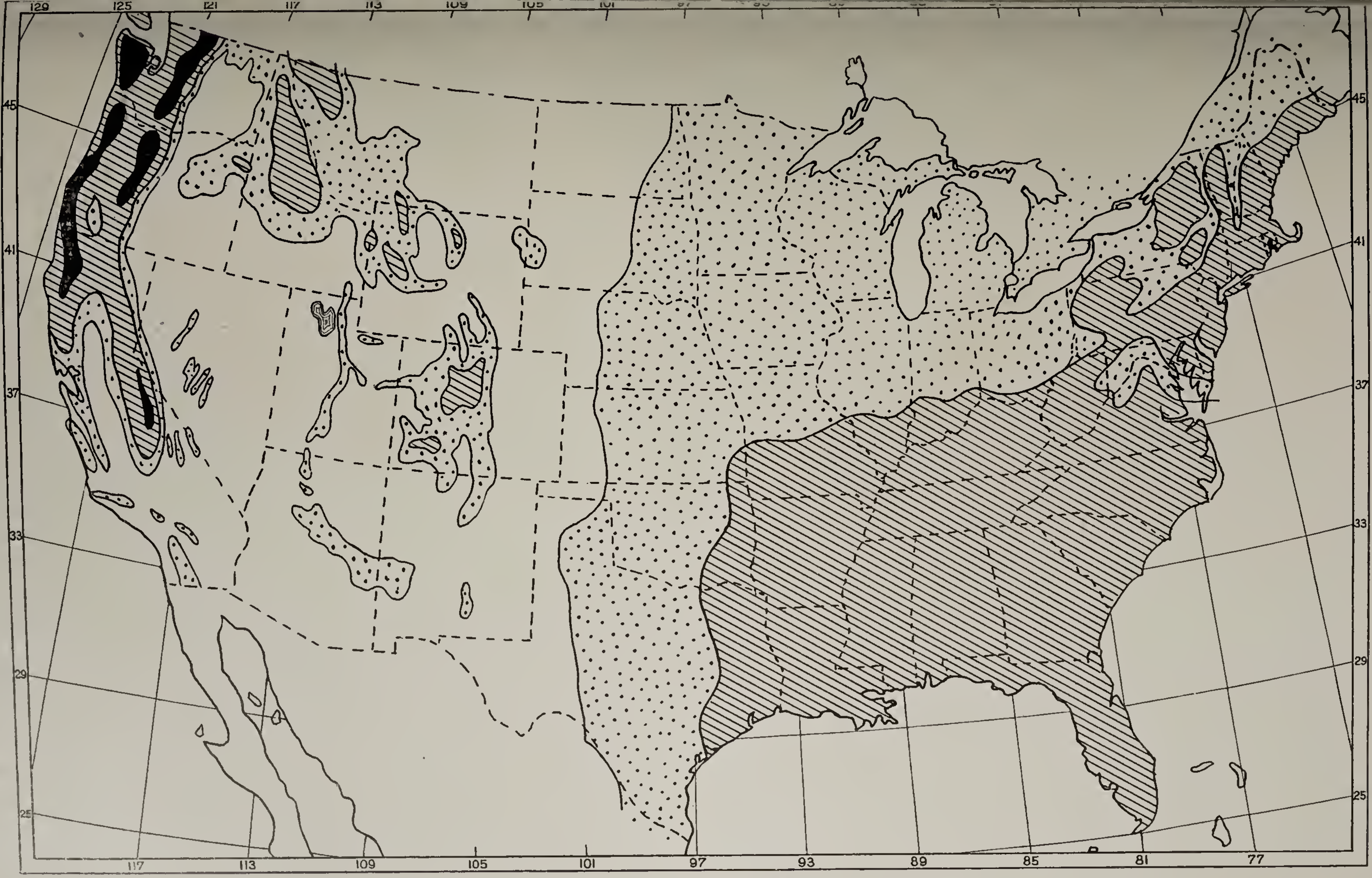

Fig. 2—The humid regions of the United States. Scale, 1:25,000,000.

Black indicates *excessive* rainfall (over 80 inches a year); ruled lines, *abundant* rainfall (40 to 80 inches); and dots *sufficient* rainfall (20 to 40 inches). The black areas are uninhabited mountains, which promise enormous water-power for the future, however. On the other two areas live the mass of the American people, on farms, or in cities or towns.

above 7,000 feet. Above the two highest gages are 4,500 feet of mountai slopes without measurements. Here the Weather Bureau contents itself wit saying the precipitation is 15 inches, plus.

A. H. Thiessen, section director for the Bureau at Salt Lake City, say on a leaflet map entitled "Normal Annual Precipitation for Utah" that th rainfall "varies from 6 to 25 inches annually at stations between 2,800 an 7,000 feet, and it is probable that as much as 30 inches or more falls at som places at the higher levels." On what does Director Thiessen base thi probability for the slopes above the gages? Upon the same facts, one supposes, that caused Mr. Gannett to put a modest 20-inch isohyetal line there— namely, the mountain vegetation and the mountain streams, which could no be maintained by the amounts of rain that fall at the levels of the gages Gannett's map runs the 20-inch line along the higher slopes of the range. I anything, it understates the truth. The geographer cannot spare this line especially in view of the considerations set forth below, which make 20 inche a critical value. The Weather Bureau map in the "Statistical Atlas" put 40 inches on the Sierra Nevada, and also on the Cascades. Gannett has 8 inches and 100 inches. Perhaps the most significant contrast between th two maps is on the White Mountains of New Hampshire. The Weathe Bureau map does not mark them with any local increase of precipitation but its 40-inch isohyet passes through them. Gannett puts on his map, whic is considerably smaller, local isohyetal lines for 50 inches, 60 inches, and 7 inches. Special interest attaches to this case because it happens that th summit rainfall is accurately known. For fifteen complete years a statio was maintained at the summit of Mount Washington. The average precipitation was 83 inches. Only twice did it fall below 50 inches.[3]

From a geographical point of view 20 and 80 inches are critical quantities, marking in a rough way the lower and upper limits of the precipitatio suited to agriculture without irrigation and, therefore, to a wide occupatio of the land with farms, towns, and cities. Other factors, of which evaporation and seasonal distribution are the most important, greatly influence th availability of a given amount of rain. But in a general way, 20 to 40 inche of precipitation may be called *sufficient* in our climate; from 40 to 80 inche will then be *abundant;* over 80, *excessive;* and less than 20, *scanty.* As th regions of excessive precipitation in the United States are limited, the fact may be set forth on two diagrams; one, of the grades of scanty rainfall, a diagram of *aridity;* the other, of *humidity,* on which the excessive rains ar included with the sufficient and abundant. It is plain that these should b contrasted. If the maps are shaded for intensity, the shading of the tw maps will grade in opposite directions.

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[3] The reader who is interested in the different points of view of meteorologist and geographer as to th theory of constructing rain maps will find a symposium of views on the subject in the *Monthly Weathe Rev.*, Vol. 30, 1902, pp. 205-243 (with the 1902 map by Gannett listed in footnote 1, another rainfall map b A. J. Henry, and a map showing relief, all on the same scale), though the writer cannot accept as his th opinions there ascribed to him on the basis of a communication of his on "The Reduction of Records o Rain Gages," previously published in the *Monthly Weather Rev.* (Vol. 29, 1901, pp. 499-500.)

On the aridity diagram the deepest tint will denote the driest grade and fall in the driest region. Figure 1 is such an aridity map. On it black is the tint of greatest aridity, less than 5 inches of rainfall in the year. The black region is fairly *desertic* like the Sahara, and measures some 35,000 square miles. It is almost wholly contained in southeastern California and includes the fast-drying-up Salton Sea and Death Valley, the lowest surfaces on the continent. It seems a little striking at first that the least rainfall should fall on the lowest surfaces, and both of them below sea-level. Possibly the Dead Sea, too, will recur to mind, with its surface 1,300 feet below sea-level. "Here rain hardly ever falls." Of course it is active evaporation that keeps these water surfaces low and; in the case of Death Valley, where there are no inflowing streams, keeps the bottom of the hollow bare, 225 feet below the level of the sea. Blue skies and high evaporation go with rainlessness; so these spots may be said in a way to be low because they are dry. The bottom of Lake Superior (– 406 feet) is still further below sea-level. Only the rains that fill it lift the water surface so high that it overflows at the "Soo." With desertic conditions its floor would be revealed as the lowest point of the continent. When water broke into the Salton sink from the Colorado, as happened a few years ago, it was rapidly lowered by evaporation, and the Sea will dry up again in a dozen years.

Next in aridity to the black area is the shaded one indicated by ruled lines, covering about 250,000 square miles in patches that always lie between mountain ranges—between the Cascades and the northern Rockies, between the Sierra Nevada and the Wasatch, between the Wasatch and the Colorado Rockies, between the Coast Ranges and the Sierra Nevada in California, and among the ranges of Montana and New Mexico. The precipitation in this area is from 5 to 10 inches, and the country is distinctly *arid*, with agriculture dependent on irrigation. Evaporation is active, and there is little promise for the future.

The lowest grade of aridity, a rainfall of 10 to 20 inches, is represented on the map by the dotted areas. They measure in all about 720,000 square miles, and form the lower portions of the great plateau on which stand the Rockies and the Basin Ranges between the 100th meridian and the Sierra Nevada and Cascades. This region is *semi-arid* in character. Portions of it in the north are susceptible of dry farming, and smaller portions both in the north and in the south can be supplied with water for irrigation. It is the most promising part of the arid regions and has the chief opportunity for future expansion now left within our domain. About half of these semi-arid lands are within the Great Basin, about half lie in a broad belt along the eastern front of the Rockies.

The blank remaining portion of the country is needed on the diagram to give proportion to the region of scanty rains. The blank surface emphasizes by its presence the various shadings of the arid region.

Figure 2 shows the contrasted diagram of humidity. The emphasis is here reversed. The arid lands of the first diagram are all blank, and black, the deepest shade, represents *excessive* rainfall (over 80 inches). As an upper limit of availability for man it might have a diagram to itself were it not so restricted in area in the United States and so scattered. It lies wholly on the northern Coast Ranges and the Cascades, with a touch on the Sierra Nevada. The area where this intense precipitation occurs may be half as large again as that of desertic rainfall. Being steep mountains, it abounds in power that the swift down-pouring water generates. When the coal fields of the world are exhausted, here is an unending motive-power for industry which must some day give the Pacific coast a complete dominance in our country. Most of Figure 2 is covered by the shades for *abundant* and *sufficient* rainfall: abundant (40 to 80 inches), represented by ruled lines, an area of nearly 1,000,000 square miles in the southeast, on the Atlantic coast, in the Pacific coast valleys, and on some of the highest ranges of the Rockies; and sufficient (20 to 40 inches), the dotted area of over 1,000,000 square miles in the Great Lakes region, the prairies of the western part of the Mississippi valley, and the Rocky Mountains. In these two rainfall regions, especially the latter, live the great mass of the American people. There are most of the farms, there are twenty-nine of the fifty cities of the United States and Canada with over 100,000 people (and most of the other twenty-one are near the Atlantic coast, where the rain is little over 40 inches).

Figures 1 and 2 draw all their facts from Gannett's map. They do not exhaust it, for they omit no fewer than twelve of its isohyetal lines; yet it is believed that they help the eye to perceive and interpret some facts that the geographer wishes selected from the mass of details that must be stored in a general map of annual precipitation. In addition to the biologic significance of the facts selected and brought into relief is their genetic importance, distinguishing the aridity of the basins, which the air can only enter by descending, from the humidity of the uplands, where the air moves upward. For the professed student a detailed chart of isohyetal lines is essential, quite as a dictionary to a student of literature; but such maps do not appeal to the average man, for they do not speak plainly to him. Even the student may find that such diagrams as those here offered may help him master essential facts. They may merely serve to remind him of the conclusions of his thinking, just as a photograph of a friend hardly tells us what our friend is like, but rather serves to remind us of the pleasure we have had in knowing him.

TRADE MOVEMENTS AND THE WAR

The war continues to produce many and varied alterations in the currents of world ade. Some are obviously temporary; the permanence of others is doubtful; yet the ening up of new channels is at least suggestive. Changes are involved in the kind, nount, and value of goods carried and in the routes along which they are borne. The rious consular reports and trade journals abound in illustrations.

In spite of our own greatly augmented trade with the Allies, the outstanding feature is e decline of world commerce, especially during the earlier months of the war. Scarcity freighters and high freight rates were largely accountable. Thirteen per cent of the orld's trade formerly in the hands of Germany and Austria has been removed with the ception of the still vigorous German trade in the Baltic; and of the 54 per cent of ade in the hands of the Allies a large amount has been diverted from its ordinary rposes. German steamers, for instance, had formerly carried about 40 per cent of e exports from the Dutch East Indies. On their removal the remaining companies ised the rates 50 per cent. Still greater increases are reported. From Moji, Japan, New York, the rates on general cargo had risen 90 per cent by March, 1915.

Unusual opportunities have been afforded to neutral shipping. The *Boletín de elaciones Exteriores,* Chile, June, 1915, says "In Spain, today, the possession of boat constitutes a mine of money" and instances the coal freighters from Gijon to arcelona that formerly charged seven or eight pesetas per ton and now demand three, ur, and even more times as much.

Transportation by sailing ship has seen a great revival. In 1909 eight steamers ere chartered to load lumber from the United States to the Rio de la Plata; sailing ssels, unable to compete, were driven from the trade; now many are returning to it. veral schooners formerly carrying coal from Chesapeake Bay to the Middle Atlantic ates and New England have gone into the South American trade. A ship recently artered in Boston to carry lumber to Buenos Aires has secured rates of twenty-two llars per thousand feet—a record price.

Among cargoes coal occupies a prominent and somewhat peculiar position. For eap rates coal depends on the accessibility of a market for return freight. The aling station of Port Said was well situated in this respect, but for some time after e outbreak of the war so little freight was carried westward through the Suez Canal at rates from India fell as low as twelve shillings, though they have lately risen to ty shillings. Since coal freights from the United Kingdom had, on the contrary, sen from nine shillings per ton to a maximum of thirty-seven shillings and six pence, became expedient to sacrifice a part of the cargo space for the cheaper Indian coal.

Some countries have suffered heavily through inability to ship their usual export. ria normally exports some 80 per cent of its wheat crop. The harvest of 1914 was cellent, but transportation facilities were closed; coal was wanting, and all baggage imals had been commandeered by the government. Beirut experienced a very serious ortage of flour and wheat. Adaptations to trade dislocation are illustrated by the oposal that British shipping unable to find return cargo from Morocco should carry ain from Casablanca and other points on the western coast of Morocco to relieve the rench ports unable to supply freighters.

The selective action of the war has greatly favored the sugar grower. The few opical countries that show increased export trade for 1914 have gained their advantage sugar, thus Mauritius, with sugar representing 97 per cent of its exports, British uiana, eastern Cuba. Other West Indian islands would report similar advances but for local disabilities. Barbados, recovering from the drought of the past few years, anticipating a good crop and corresponding profits for 1916. In Peru sugar has prove much the most lucrative product during the past year, though profits have been dimi ished by the scarcity and high charges of freighters. In April, 1915, the cost to Live pool had almost trebled the old rate. The good market for sugar has had its customar effect on industry on the Peruvian coast. Since the Civil War and the boom in Peruvia cotton that accompanied it the sugar and cotton industries have prospered in compl mentary ratio. In 1913 the low price of sugar and the bull cotton market caused considerable increase in production of the latter crop. Now the process is being reverse and it has been further encouraged by the fact that depression came at the time whe farmers were requiring money for the planting of the new crop. Like cotton, Peruvia exports of copper and petroleum have suffered from the preference for sugar shipmen The latter decreased by 44,755 tons, or 56 per cent, in the last five months of 191 Here, however, suspension of works in the Chilean nitrate *oficinas* was a contributor cause.

Complications attendant on the readjustment of commerce are well exemplified the American consular report from the Belgian Congo for 1914. In the latter part 1915 the first American ship to enter the Congo delivered the first general cargo shipp thither from the United States. Despite the fact that the goods delivered proved sati factory, the only duplicated orders have been for flour, petroleum, and a little suga The reason lies in part in the lack of reciprocal trade—there is no American mark for the copal, cacao, palm oil products of the Congo—but still more because the prese financial basis of all Congo industry lies in European hands, in Brussels, Antwerp, a Liverpool. As in the case of the previously cited money crops of Peru, external econom conditions exert a powerful control over production. Before the crop is harvested has been sold and advances made on it by the local banks. In consequence form German imports from the Congo have been sent to Liverpool, though at a loss, for la of a market.

There are other instances of the movement, temporary at least, away from the gre European entrepôts. Cuba and Denmark, among other countries that used to obtain ri from the continental markets, have obtained shipments direct from Burma. Cuba to five times as much—over 27,000 tons—in 1915 as in the previous year. Some of the o well-established triangular routes have been abandoned for the time being. America vessels carrying manufactured goods to South Africa and returning home via Euro have lately carried return cargo, including wool, direct to America. Promise of mo permanent commercial advance is in the hands of Spain. Cargoes of nitrate have be obtained from Chile without the intermediary of a French, Belgian, or German mark A proposal is on foot to connect the two countries by direct steamship service and erect in some convenient Spanish port, preferably Barcelona, a depot to supply t whole of the agricultural zone of the Mediterranean. Of the benefits that would accr may be noted the provision of a return cargo for vessels carrying wheat from Russ and accustomed heretofore to return in ballast, and the possibility of increased expo trade with Chile. At the present time the latter country obtains practically all h imported olive oil via the United States and thus receives a product far inferior to t pure variety that could be shipped direct from the country of origin.

OVERCROWDED PORTO RICO

The Hon. Arthur Yager, Governor of Porto Rico, in a paper on the "Fundamental Social and Political Problems of Porto Rico," read at the Lake Mohonk Conference, October 22 last, gave a most suggestive and informing discussion of serious problems involving the well-being of the Porto Ricans. Probably few of our citizens have realized that the island is one of the most densely peopled parts of the earth and that food requirements bid fair to outstrip the local means of supply. In many other respects Porto Rico exhibits characteristics peculiar to island geography. Governor Yager said there is much wretchedness and poverty among the masses of the people. Their dwellings are, for the most part, mere hovels, almost devoid of furniture and crowded beyond belief. Their food consists of rice, codfish, and beans, supplemented by the native fruits. Their wages are, as a rule, barely sufficient to maintain their existence. These conditions have prevailed in Porto Rico for many years, and, while much has been done to improve and build up the island since the American occupation, it has not been possible to make any very marked improvement. The fundamental cause is the dense population, now conservatively estimated at 1,200,000 people. It was 1,118,000 in 1910, according to the official census, and it has been steadily increasing since that date.

The gross area of the island, land and water, including the small adjacent and dependent islands, is 3,435 square miles, and the present population therefore is nearly 350 to the square mile. This is a greater density than that of China proper (200 to the square mile in 1910) or of India (175) or of Japan (362). It is more than ten times greater than that of the United States proper (30.9) and over three times as great as that of New England (105.7). In fact there are only two states in the American Union that have more people per square mile, viz., Massachusetts (419) and Rhode Island (509), and in these states about three-fourths of the people live in cities and depend upon manufactures, while in Porto Rico only about 10 per cent of the people live in cities of more than 10,000 population and there are almost no manufactures. In short, if we consider both the area and the industrial development of this little island there is perhaps no region in the world, save Java, more densely populated.

The island is about four-fifths mountainous, much of it so steep that it can hardly be cultivated, and yet this great population is so evenly distributed over its whole surface that the center of population is only about 5 miles in a straight line from the geographical center of Porto Rico. Moreover, the population has been produced by the natural increase of the people of the island. There is practically no immigration and, according to the census of 1910, only about one per cent of the people are of foreign birth.

Furthermore, the population is still steadily increasing. The first census, taken by the Americans in 1899, enumerated in round numbers 953,000 persons in Porto Rico. At the present time they exceed that number by 250,000. By comparison with the census taken by the Spanish government in 1887, which enumerated 732,000, we find that in the twenty-two years immediately preceding the coming of the Americans there was an increase of 221,000 people, or about 30 per cent, while in the sixteen years since the American annexation there has been an increase of 250,000, or about 27 per cent. To put it another way, during the latter part of the Spanish period, the average annual increase was about 1.3 per cent, while during the whole of the American period, it has been 1.6 per cent. The increase last year, according to the official reports of births and deaths, was 24,000, or 2 per cent, of the whole population. This rapid increase in population has been made possible by the commercial expansion and industrial development that has followed the American occupation. This expansion is made evident by the following figures:

The production and export of coffee remain at about the same figure as in Spanish times. The output of the sugar industry has been mutiplied by six, going up from 50,000-60,000 tons in Spanish times to about 350,000 tons at present. The export of tobacco, cigars, etc., has been increased more than ninefold, rising in value from about $1,000,000 in Spanish times to about $9,250,000 at present. The fruit industry has been created and developed entirely by the Americans, the exports, during the past year, reaching a total of about $4,500,000. The enormous increase in the exports of the whole island may be further illustrated by comparing the figures for 1901, which show total exports of slightly more than $8,500,000, with those of the present, which are about $49,330,000.

Gov. Yager added: ''This large expansion of commerce has enlarged greatly the opportunities for employment among the laboring population. Instead, however, of raising the standard of living and increasing the wages of agricultural workers in any marked degree, it has resulted chiefly in a large increase of their numbers. The conclusion seems to be that Porto Rico has reached that painful stage in its economic development where the natural increase in its population has outrun the means of employment and where the standard of living has consequently been pressed down to the lowest limit.

''The people of Porto Rico are a kindly, charitable, lovable people; their patriotic love of their island home is worthy of all praise. The devotion of parents to their children, especially of the mothers to their offspring, is equal to that shown among the people of any land. But, owing to their inherited improvidence, their racial characteristics, and perhaps to the tropical climate, those checks upon population which in colder climates seem adequate to keep the increase of the people well within the limits of subsistence seem to be lacking among them. The birth rate seems to bear no relation whatever to the conditions of industry and the opportunities for employment.

''I call attention to this problem because it seems to me that those of us who are responsible for the future of the island should face it now. In my judgment it is not only important but it is urgent. With the population already pressing hard upon the means of employment, if any unexpected calamity should befall any of the island's industries there would result more serious suffering among the laboring people than the insular government could possibly relieve, with the means at its command. If, for example, a cyclone should devastate the coffee plantations, as actually happened in 1899, the situation might become very critical. Or if, as now seems certain, the protective duty on sugar should be abolished, and the decline of that great industry, which everybody predicts, should actually take place, the problem of feeding the unemployed would soon become most serious.

''What, therefore, should be done to meet and forestall the coming of even worse conditions than now exist? I do not hesitate to express my belief that the only really effective remedy is the transfer of large numbers of Porto Ricans to some other region. I do not believe that there is in history any instance of a country that has reached the overcrowded condition in which Porto Rico now stands, that ever escaped from it without the aid of emigration. Whatever can be done in other ways to improve conditions should still be done, but those things alone will not solve the problem.

''At present there seems to be only one country that lies hopefully open to a movement of Porto Ricans out of their own island, and that is Santo Domingo. Many have gone there in spite of the dangers due to the unstable political conditions. Santo Domingo is only about eighty miles from Porto Rico. It is almost identical in climate, physical characteristics, products, people, and language. On this account there would be little shock in change of residence. It has now only about thirty people to the square mile. Vast stretches of fertile virgin soil await labor, and the two islands could be made to fit together like hand and glove.

''I believe it to be the duty of the United States to make, if possible, such arrangements as may accomplish the purpose that these two neighboring islands, over which the American government has assumed complete or partial control, should supplement each other's needs with respect to population and social development. . ... Treaty arrangements might be entered into between the governments of the United States and Santo Domingo which would include a practical scheme of emigration under governmental encouragement and aid of the surplus population of the smaller island to the unoccupied lands of the larger. In this way the greatest problem of both islands would be solved through the redistribution of population. That there would arise some complications and practical difficulties in carrying out this scheme is doubtless true, but that it is feasible and practicable if undertaken earnestly, I have no doubt. That it is within the power and rights of the American Government in view of its responsibilities in both of these islands as well as in the Caribbean Sea generally seems to be clear, and that it would meet general approval among the people of both islands seems highly probable.''

NEW BATHYMETRICAL CHARTS OF THE OCEANS*[1]

None of the maps hitherto available showing ocean depths, such as the Prince of Monaco's map or the maps in the *Challenger Report,* Berghaus' *Physical Atlas,* or the atlases of the Deutsche Seewarte combine in one the advantages of the present set of three maps. They are the first to represent on an equal-area projection the bathymetry of each ocean on a single sheet, on a scale small enough to afford a general survey and yet large enough to retain details. They are based on all of the available material up to January, 1912, and bear evidence of a degree of scientific worth hitherto unattained in this field.

The scale of all three maps is the same, viz., 1:40,000,000. The maps of the Pacific and Indian Oceans are drawn on Lambert's equal-area azimuthal projection, the map of the Atlantic on Lambert's equal-area cylindrical projection.

The limits of each map are ingeniously chosen. The Atlantic is shown in its entire extent, as defined by Krümmel, from the coast of West Antarctica beyond and including the Arctic Mediterranean to Bering Strait, and, on the east and west, including the European and the American Mediterranean. The map of the Indian Ocean includes, in the north, the Red Sea and the Persian Gulf, in the south, the whole of the Antarctic Continent and, in the east, the basin and trough region to the east of Australia and in the Malay Archipelago. The map of the Pacific Ocean on its eastern margin represents the beginning of the Greater Antilles with the Porto Rico Trough and, on its western margin, the Sunda Trough to the south of Java, so that this map includes all the oceanic troughs of the world.

The color scheme produces a plastic effect. The continental shelf, in pale yellow, and the troughs, in three shades of red, are admirably brought out; the intervening depths for every thousand meters are represented in six shades of blue. The line element is drawn with the greatest delicacy; in this it is in keeping with the great care and accuracy which pervades the whole undertaking. A text of 91 pages accompanies the maps. It affords an insight into the development of the work from the formulation of the problem through the selection of suitable projections and the preparation of intermediate maps, with their great amount of data of unequal value, to the final drawing. To his own draftsmanship the author applies the same strict control. Thus an estimate of the value of the work is possible in every respect, a circumstance which deserves special commendation.

The distribution of existing soundings, as is evident from the figures entered on the maps, is very unequal. They are, of course, densest in the North Atlantic. Except for he center of the Polar Basin there is hardly a five-degree "square" which does not contain at least one sounding, while in the South Atlantic there are many such, even in uxtaposition. In the latter, mainly south of the Tropic of Capricorn, the few definite outes stand out along which soundings have been made. In the mid-latitudes of the North Atlantic, however, there is only one region where there is a prominent gap, viz., n the area extending north to Davis Strait from the latitude of the Strait of Belle sle. This would be a fruitful field for Canadian oceanography. In the Pacific there s a marked contrast between the now so well charted marginal areas of Australasia and he vast main body of the ocean, which, aside from a strip extending diagonally across t from Fiji to San Francisco, is conspicuously blank over wide expanses. In the Indian Ocean, also, except for its borders, the sounding routes still stand out too prominently, and between Tasmania and Kerguelen there is a zone totally devoid of soundings.

LUDWIG MECKING.

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* Translated from the original written in German for the *Review.*

[1] M. Groll: Tiefenkarte der Ozeane. 3 maps with 91 pp. of text. *Veröffentl. des Inst. für Meereskunde, Neue Folge, A: Geogr.-naturwiss. Reihe,* Heft 2. Berlin, 1912.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

Annual Report of the Society. The annual meeting was held at the Engineerin Societies' Hall, No. 29 West Thirty-ninth Street, on Tuesday evening, January 2 1916, at 8:30 o'clock, President Greenough in the chair. The following perso recommended by the Council were elected Fellows:

Harry Calvin Berger
Robert M. Bleakie
Edward Andem Bryant
F. Garcia Calderon
Paul Chalfin
Edward Ball Cole
William H. Coolidge
Clayton Sedgwick Cooper
Alexander M. Crane
C. T. Crocker
Douglas Crocker
Elliott C. Cutler

George E. Dadmun
Timothy J. Daly
Harold W. Dana
Edward J. Davis
Robert C. Davis
J. Randall Dean
Nevin M. Fenneman
Armin K. Lobeck
Thomas D. Murphy
Andrew H. Palmer
C. J. Posey
Mrs. A. D. Rawson

Report of the Council

The annual report of the Council, approved at the January meeting, was read follows:

To the Fellows of the American Geographical Society:

In a review by the Council of the affairs of the Society for the past year the fir thought is necessarily of the European War. Whatever may be the individual sy pathies or leaning of any observer of the gigantic contest, he cannot fail to welco all the information which may help in understanding the people and countries involve or in following the military movements reported by the press. Accordingly the Socie has so directed its publications, lectures, and exhibitions that they might assist i members and the public toward this desirable end; and it has been gratified at t interest displayed by a large contingent who have availed themselves of these faciliti The relations of the Society with its correspondents throughout the disturbed area Europe have been maintained with less interruption than might have been expected, a its monthly journal presents a well-rounded chronicle of kindred associations and event

An important and progressive change has been made in the title and scope of t Society's *Bulletin*, which will henceforth be known as *The Geographical Review*, designation which describes more accurately its plan and contents. The Janua number, already issued, presents an account and an example of the publication proposed. It is hoped that the *Review* may bring the Society in still closer touch wi its members and the scientific readers whom it aims to reach, by offering an increas contribution of material maintained at the highest possible standard of scientific a literary interest. During the twelve months of 1914 there were published in the *Bullet* forty-seven original papers by eminent authors, besides notes of geographical interes book reviews, map notices, and bibliographical lists and indices of most comprehensi character.

The number of Fellows at the close of the year was 1,151, of whom 362 are Li Fellows, an increase of 24.

There have been added to the library and map room during the year 1,171 book 4,960 issues of periodicals and pamphlets, 68 atlases, and 2,647 sheet maps. Importa progress has been made in binding a large number of unbound publications in t library, and steps have been taken to complete the binding of all the Society's unbou collection.

Twelve meetings of the Society were held at which addresses were made by t following speakers: William Elliot Griffis, Will S. Monroe, Edgar James Banks, B. Baumgardt, Glen Arnold Grove, Harry Clarke Ostrander, Herbert Lawrence Bridgma Wilfred Harvey Schoff, Henry R. Rose, and Margaret Chapman Bolles.

The Charles P. Daly gold medal of the Society was awarded to Professor Paul idal de la Blache and was presented to him in Paris by the American Ambassador.

The customary joint annual meeting with the Association of American Geographers vas held at the Society's building on April 9 and 10. The gathering was in every way success, showing a largely increased attendance and an improvement in the number nd character of the papers presented.

Reference is made to the accompanying report of the Treasurer regarding the current evenues and expenditures during the year. The invested funds of the Society have een increased by a legacy of $10,000 received from the executors of the late Herman Von Post, who was a constant friend of the Society during his life.

On July 1, Dr. Isaiah Bowman entered upon his duties as Director of the Society, nd already his influence and abilities have made themselves felt.

The resources at the Society's building for study and reference are increasingly used y scholars and the public. The permanent value of timely exhibits of maps and photoraphs is indicated by the growth in the number of visitors to our exhibition rooms rom 25,000 in 1914 to 32,800 in 1915. The number of students who have spent some ime in serious study of geographical books at the Society's house has increased in the ame period from 92 to 145 and the number of map consultants from 65 to 170. Nearly alf of these consultants are professional geographers from colleges and universities, eachers of geography in the public schools, publishers, editors, journalists, and men f affairs. Through them we reach thousands who cannot themselves make direct use f our collections.

The staff continues zealous and efficient, and in general the condition of affairs and f the work gives cause for satisfaction.

Respectfully submitted on behalf of the Council.

John Greenough
Chairman

REPORT OF THE TREASURER FOR 1915

The report of the Treasurer, Mr. Henry Parish, Jr., was read:

n January 1, 1915, there was on hand in general account, a balance of			$1,032.43
(of which $375 was capital awaiting investment.)			
uring the year there have been received from fellowship dues, sales of publications, interest on investments, and donations applied to general purposes		$42,283.40	
onations for other and special purposes	$6,263.50		
rought forward from 1914	4,939.23	11,202.73	53,486.13
egacy			10,000.00
			$64,518.56
here have been expended for salaries, meetings, purchase of books and maps, library, publications, house expenses, insurance, postage	$46,096.00		
or special purposes, Memorial Volume, etc.	4,420.54	50,516.54	
nvestment of legacy and capital above		10,375.00	60,891.54
ash in general account		$1,257.43	
nexpended donations		2,369.59	$3,627.02

The reports of the Council and the Treasurer were approved and ordered on file.

REPORT OF THE SPECIAL COMMITTEE

The Report of the Special Committee charged with the duty of selecting candidates for the offices to be filled was presented and read:

NEW YORK, January 25, 1916.

The Special Committee appointed December 16, 1915, to nominate and invite suitable persons to fill vacancies in the offices of the Society existing at the date of its annual meeting in January, 1916, respectfully report that they recommend the election of th following gentlemen to the offices designated:

		TERM TO EXPIRE
President	John Greenough	1917
Vice-Presidents	Paul Tuckerman	1917
	James B. Ford	1919
Recording Secretary	Hamilton Fish Kean	1919
Treasurer	Henry Parish, Jr.	1917
Councilors	Frank Bailey French E. Chadwick Levi Holbrook Archer M. Huntington Charles A. Peabody	1919

Hamilton Fish Kean
Archibald D. Russell *Committee*
Paul Tuckerman

The vote of the Society was unanimously in favor of the persons recommended b the Council and they were declared duly elected.

President Greenough then introduced the speaker of the evening, Mr. Samuel Ald Perrine, who addressed the Society on "India."

At an extra inter-monthly meeting on February 8 Mr. James Barnes of New Yo addressed the Society on a trip across Africa. The lecture was illustrated by excelle motion pictures of animal and native life, taken by Mr. Cherrie Kearton. The tr led from Mombasa on the Indian Ocean across British East Africa, with a si excursion to the Guaso Nyiro, and down the Aruwimi and Congo Rivers to the Atlanti

Award of the David Livingstone Centenary Medal. The Council at its regul monthly meeting on January 20 awarded the David Livingstone Centenary Medal in go to Sir Douglas Mawson in recognition of his discoveries and explorations in Antarcti in 1911-14. It will be recalled that this medal was founded in 1913 by the Hispan Society of America upon the occasion of the one-hundredth anniversary of the birth David Livingstone. It is awarded by the American Geographical Society "for scie tific achievement in the field of geography of the southern hemisphere." Sir Dougl Mawson is the first recipient of the medal. His explorations are of special inter to Americans in that they have confirmed the discoveries of Captain Charles Wilkes 1840, who established the existence of land—since generally known as Wilkes Land along the Antarctic Circle south of Australia and from it correctly inferred the existen of a continental land mass in the south polar region. During the winter of 1914-15 S Douglas lectured before the Society, giving one of the most fascinating accounts of pol exploration ever heard in New York.

NORTH AMERICA

Alaskan Forests. Neglected Alaska is coming into its own. We are beginning to a preciate its many resources—not the least of them its forests (The Forests of Alask by Henry S. Graves, *Amer. Forestry,* Vol. 22, Jan., 1916, pp. 24-37). Fortunately t greater part of the most valuable forest, that of the Pacific Coast zone, is under gover ment control, in the form of two national forests. In the southeast the Tonga National Forest occupies about 15,000,000 acres; centering about Prince William Sou the Chugach National Forest accounts for another 5,368,044 acres. From much of t intervening ground the forest is excluded by ice or by the extremely rugged topograp The coast forest is a continuation of that of British Columbia, Washington, a Oregon, modified, of course, by the effects of increasing latitude, but with its hea rainfall and equable climate still distinguished by large stands of good quality timb The trees are smaller, and some species, the Douglas fir, for instance, have dropped o Red and yellow cedar appear in the Tongass Forest, but throughout the entire b Sitka spruce and western hemlock are the predominating species. Shorter growi season, less rainfall, and considerable accumulation of muskeg are less favorable forest growth in the Chugach region, especially in the northwest, where the coast for passes into the interior type. The interior forest may be regarded as an extension the great spruce forest of northern Canada. Its chief species are the white spru white birch, and cottonwood. Slow and stunted growth and limited distribution p clude it from ever realizing an outside market, but its local value, especially in th ys of early settlement, is very considerable. Unhappily, careless use and forest res have already wasted much. It is estimated that 1,000,000 acres have been lost nually from the latter cause during the past twenty years. Ten years ago quantities f timber had to be imported into the Yukon mining camps from Puget Sound. On the ast, too, timber is still imported, but this will not be permanent. At present the high st of labor and the abnormally low price of southern lumber enable the Washington ills to compete successfully. The Tongass forests must develop in time. Besides their lue in timber content, they are easily accessible—the shore line has an extent of 2,000 miles—and there is abundant water power for running saw or pulp mills. Under roper management they can be made to yield not less than 500 to 600 million feet f timber per annum. Under public ownership they are open to development and even ow supply a variety of local requirements, such as docks, mines, canneries, agricultural ttlements.

Potash Resources of the United States. The war has enveloped the future of the otash industry in a cloud of speculation. One fact, however, has been clearly proved— at the United States possesses raw material in sufficient quantity to much more than pply its own requirements and that no insuperable physical obstacle prevents producon of the commercial product. The commercial practicability of production is, howver, another matter, and it remains unsettled (Possible Sources of Potash in America, y Frank K. Cameron, *Journ. of the Franklin Inst.*, Vol. 180, 1915, No. 6, pp. 641-651). he country has four possible sources of potash. Large deposits of potash feldspars ccurring in various localities are known to contain 10 per cent or more potash, but it as not yet been proved that the cost of extracting the raw material or of refining the roduct is not prohibitive. The widely distributed potassium salts of desert basins are general too little concentrated for practical working. There is one known possible xception. A "miner's chance" is in the process of exploitation at Searle's Lake, San ernardino County, California. Below the mud surface of the "lake" is a layer of rine with potassium chloride yielding 5 to 6 per cent potash. Ordinary crystallization ethods have failed to obtain a sufficiently pure product from the mixture of soluble lts, but the company now engaged in the exploitation is working on new methods of paration. Other difficulties lie in the way of utilizing the alunite deposits of southern tah—transportation problems and lack of local markets for the by-products that decide he balance between profit and loss. At the present moment two companies are in operaion and may succeed on a small scale. The most hopeful prospect rests with the giant elps of the Pacific Coast. The sun-dried alga contains 16 per cent potash and is an xcellent fertilizer. The plant can be harvested on a vast scale, far exceeding any home equirements, but the technology of the drying process has not yet been worked out in a ractical way. Another deterrent is also likely to arise. The beds of algæ lie within he limits of the state, and no satisfactory legislation exists in regard to them.

Population Controls in Montana. White settlement in Montana was first conrolled by the waterways. Following the Lewis and Clarke expedition fur trading posts ere established on the Missouri and Yellowstone Rivers, whence furs went out and upplies came in from St. Louis,—in the early days an upstream journey of six months. ith the coming of the steamboat in 1829 river traffic expanded rapidly, reaching a aximum after the discovery of gold, 1861-1862, and before the arrival of the railroad, 883. The first control of the more permanent settlement was the mineral wealth of the ountains. In 1870 about 75 per cent of the population was living in four mining ounties occupying less than 9 per cent of the total area of the state. Conclusion of he Indian wars in the later seventies opened up the eastern plains to cattle ranchers nd sheep men, whose occupation was largely determined by the limited water supply. rofound changes of distribution commenced with the new century and the discovery of he dry-farming possibilities of the bench lands of the east. Today the value of Monna's agricultural products exceeds that of her minerals. Railroads that formerly served nly the mining districts are now seeking the most favorable agricultural locations. A ise of the newest control—manufacturing—is seen in the increasing city population. ccording to the 1910 census six cities had a population of over 10,000. (Geographic nfluences Affecting Distribution of Population and Character of Industries in Monna by O. A. Freeman, *Inter-Mountain Educator*, Jan., 1916.)

Glaciation of the San Juan Mountains, Colorado. For some years Professor . W. Atwood of Harvard University has been studying the San Juan Mountains region southwestern Colorado. He now presents (Eocene Glacial Deposits in Southwestern olorado, *U. S. Geol. Surv. Prof. Paper 95-B*, pp. 13-26) some conclusions of importance oncerning the physical geography of the region in relation to early Tertiary glacial deposits discovered in the foothill belt at the northwest base of the massif. In th discussion of the origin of glacial deposits there is published the following diagrammati cross-section which summarizes the physical history. It is concluded that during th dissection of the early San Juan Mountains (the uppermost of the three shown in th diagram) ice formed in the higher valleys and descended to bordering lowlands. Afte the disappearance of the early Tertiary ice a peneplain was developed, bordered on th

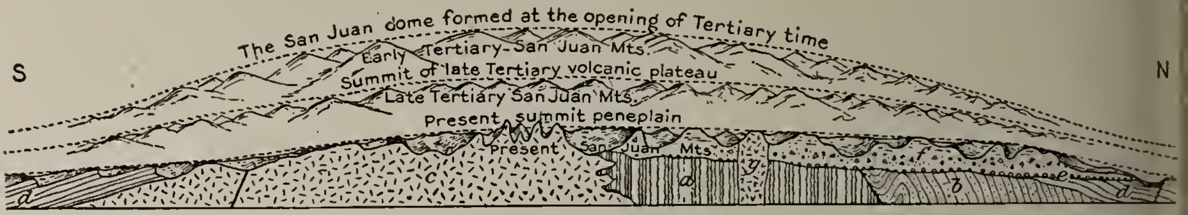
The San Juan dome formed at the opening of Tertiary time
S
N
Early Tertiary San Juan Mts.
Summit of late Tertiary volcanic plateau
Late Tertiary San Juan Mts.
Present summit peneplain
Present San Juan Mts.
a
b
c
d
e
f
g

FIG. 1—Diagrammatic cross section showing the physiographic evolution of the San Juan region since the beginning of Tertiary time. *a*, Pre-Cambrian schist and gneiss; *b*, Algonkian quartzites; *c*, Pre-Cambrian granitic intrusion; *d*, Paleozoic and Mesozoic rocks; *e*, Ridgway till and Telluride conglomerate; *f*, middle and late Tertiary volcanics; *g*, Tertiary intrusives.

Reproduced from Fig. 11, *U. S. Geol. Surv. Prof. Paper 95-B.*

west by mountains. Both mountains and peneplain were affected on the one hand b erosion and on the other by vulcanism, the latter producing a great volcanic platea Further dissection followed the warping and doming of the summit peneplain an produced, with glacial agents, the present San Juan Mountains. It is further conclude that continuing uplift stimulated valley erosion and resulted in the cutting of the present deep canyons below the level of the broad glacial troughs.

Irrigation and Rice Cultivation in Texas. A few years ago Texas was the foremost rice-producing state of the Union. This was the boom period that followed th introduction of improved cultivation methods in 1895. Ravages of the boll weevil i the cotton fields helped to turn attention towards rice-growing, and the plentiful supp of good cheap land encouraged extensive cultivation. From the Louisiana boundary t the River Guadalupe the black clayey soil of the coastal plain is eminently suited t rice-growing: but profit from rice as a frontier crop could not be of long duratio Impoverishment of the rich soil, scarcity and high cost of labor, with other economi restrictions, necessitated the adoption of intensive methods. The problem of successfu rice production has essentially resolved itself into the problem of scientific irrigatio (C. G. Haskell: Irrigation of Rice on the Coastal Prairies of Texas, *Texas Dept. o Agriculture Bull. No. 43*, pp. 88-116). In many respects the Texan rice zone is we adapted to irrigation. The surface of the land is level and the subsoil impervious. Th considerable rainfall (averaging 46 inches per annum, with 60 per cent in the growin season), the large amount of water surface, and the height of the water table provid or conserve a very fair water supply. Moreover the length of the growing season— 273 days—permits an extended period of planting and hence a more equitable use o the water. Well construction is practicable throughout much of the region. Near th Gulf, water-bearing layers are struck at little depth. Deep wells, indeed, cannot be employed in the coastal fringe, for they tap salt water, which, even in small amounts, i harmful to the young plant. A similar disadvantage may be encountered in strea irrigation near the shore, when a low stage of the river water causes inflow from th sea. Altogether wells supply about 17 per cent of the irrigation water, a smalle proportion than during the early days of more isolated settlements. The well source i advantageous in times of adequate and uniformly distributed rainfall, otherwise cana irrigation is more economical. Irrigation of this latter type affords great scope fo development along co-operative lines. Economies can be effected by the use of commo arteries and pumping apparatus. Cheap and efficient running of the latter is particularly desirable. One of the factors determinant of cost is the accessibility to fu resources. In the vicinity of the oil-fields a cheap fuel is available. Smaller and mor isolated plants are frequently able to use wood from the forested borders of the prairi lands. The question of water control is one of the most interesting. About one-thir of the water used is controlled by the users; a greater proportion is obtained by ca rental and the rest by payment in kind—either a certain share, usually one-fifth, or fixed amount of the crop. In a few cases the farmer is a *métayer* paying a share of th crop for land, water, and seed. Distribution of the rented water is regulated by leve riders on whose honesty and discretion depends much of the smooth and effectual workin of the system. Occasionally echoes may be heard of the dissensions that are as old a the beginnings of irrigation, dissensions that vexed the earliest irrigators in Babylonia and today still perpetuate constant discord along the 1,600-mile stretch of coast that forms the western desert of South America.

Mexican Land Grants in California. The history of old Spanish grants in United States territory has always been replete with judicial uncertainties. An account of grants bestowed by Mexico in California is given by C. C. Baker in the 1914 issue of the *Annual Publications of the Historical Society of Southern California* (Vol. 9, Part 3, pp. 236-243). From this it is gathered that although the American government did not intend to annul the grants of land made by Mexico, a study of the United States patents covering the old grants reveals occasional imperfections in the titles to land properties.

Altogether seventy-eight patents were issued, covering an area of 1,419,475 acres. Some were of considerable dimensions. The San Fernando Mission estate comprised 116,858 acres of land. The Simi grant followed with 113,009 acres. Nine patents covered 40,000 acres each. The names of some of these grants are perpetuated in the towns. San Pedro is an instance in point. The beach cities of Santa Monica and Redondo are others. It is interesting to note that the missions retained but little of the vast tracts they once claimed. Such parceling of property has steadily taken place since the beginning of American sovereignty over the region.

The War and Cuban Commerce. While eastern Cuba is enjoying a period of prosperity, the western part of the island is plunged into such serious financial distress that congress has been compelled to vote a considerable sum for relief amongst the working people and has offered free railway transportation to conduct labor from west to east (The Cuban Tobacco Industry, *South Amer. Journ.*, Vol. 79, No. 23, Dec. 4, 1915). Eastern Cuba produces sugar. The diminution in supply of the European product has enabled her to dispose of the excellent 1914-15 crop at highly remunerative prices. On the tobacco industry of the western section of Cuba the war has had a contrary effect. Increased taxation on the import of this commodity into the United Kingdom has reduced the demand from Cuba's second largest customer. More recently the British prohibitions on imports—including tobacco—which became effective March 1, have produced the gravest apprehension among the tobacco producers of the West Indies, especially Cuba.

SOUTH AMERICA

Economic Regions of South America. A recent publication of the Bureau of Foreign and Domestic Commerce of the Department of Commerce entitled "Banking Opportunities in South America" by William H. Lough (*Special Agent Series, No. 106*), though devoted primarily to banking problems, contains some facts of interest to geographers. The author, by way of introduction to his report, proceeds to show that, economically, South America may be divided into four rather distinct regions. The first is the Amazon basin, comprising most of northern Brazil and the eastern lowlands of Peru and Bolivia—the regions of tropical forests. Next to rubber, sugar and cacao are the main products. The second region includes the River Plate basin, southern Brazil, and northern Argentina. This region he designates "the fertile, prosperous, and partly developed agricultural section of South America." The northern portion of this division contains the great coffee-producing section of Brazil, while the River Plate valley is one of the great sources of supply of live stock and grain. A third region embraces the west coast, comprising Chile, western Bolivia, Peru, and Ecuador. Minerals, notably copper, tin, and nitrates, are the chief products, although there are fertile sections (not along the coast) whence are obtained grain, cattle, and fruit in the southern part of the region, and cotton, sugar, and cacao in the warmer northern sections. The fourth region comprises the north coast—Colombia and Venezuela, producing coffee, sugar, cacao, tobacco, and tropical fruits, and containing, in the interior mountainous section, important mineral resources. If a fifth region were to be marked off, he would make it by subtracting from the second region its northern portion—the great coffee-producing section of Brazil. "Each one of these four regions," says Mr. Lough, "has an economic life of its own. Their products, their shipping routes and trade connections, and their populations are quite distinct. It is probably safe to say that each of the four regions has much closer relations with the United States and Europe than with any of the other three regions."

Avard L. Bishop.

The Economic Development of São Paulo. Nearly a decade ago, in an endeavor to remedy the results of the overproduction of its staple the state of São Paulo undertook an extraordinary fiscal experiment,—the valorization of coffee (*cf.* "Brazil's Failure to Control the Price of Coffee,'' *Bull. Amer. Geogr. Soc.*, Vol. 41, 1909, pp. 220-222). The loans contracted for that purpose in 1907 have now been amortized, but it is anticipated that the supertax of 5 cents per sack on exported coffee levied for the purpose will be continued (*Suppl. to Commerce Repts.*, No. 40d, Nov. 16, 1915). Coffee still forms 99 per cent of the foreign exports of the state, and it is estimated that the supertax will contribute over half the total revenue. This progressive state is continuing its policy of encouragement of diversified production. The needs of a growing population and the influence of the state department of agriculture have increased the area planted to crops, especially corn. Wheat, however, has not yet proved a success. A notable advance has also been made in the meat-packing business.

Rubber in Argentina. A variety of the rubber plant occurring in the department of Orán in northern Argentina is described by C. Spegazzini in the July-August, 1914, issue of the *Anales de la Sociedad Científica Argentina.* It is locally known as *verdenasco* or *zarzaparrilla blanca silvestre.* Its botanical name is *Smilax campestris Grisb.*

The rubber yielded by this plant differs from the familiar product by a greater degree of solubility in ethyl alcohol. It is described as amorphous, inodorous, without marked taste, and highly elastic. It is insoluble in and impermeable to water. On the other hand, it melts readily in solutions of carbonic sulphide, benzine, or chloroform. The product is characterized by rapid vulcanization in the presence of a sulphurous solution. When burned it emits the characteristic odor of rubber.

EUROPE

Northern Outlets of the Mediterranean Basin as Historical Factors. An enlightening contribution to the history of the Mediterranean basin is presented by Miss Semple's studies of its northern breaches in the *Annals of the Association of American Geographers* (Vol. 5, 1915, pp. 27-59). The favored lands surrounding this sea were cut off from the rest of the world during prehistoric ages by mountain or desert barriers. Their early inhabitants were left to themselves. Eventually contact with northern foreigners was brought about through the existence of four important breaches in the northern rampart of uplifts. From east to west Miss Semple designates them as the Bosporus-Hellespont breach, the Morava-Vardar furrow, the passes of the Julian Alps and the Karst, and finally the Rhone Valley breach. They are the main avenues of intercourse between northern and southern Europe. Migrations, trade, or military expeditions have flowed through these channels.

The importance of Miss Semple's researches is illustrated in the case of the Rhone basin gap. Lying between the pile of primary rocks of the Massif Central and the Tertiary folds of the Alps, it forms, together with the valley of the Saône, a corridor which links the Mediterranean to the ancient land of Burgundy. The breach branches out here, fork-like, into the valley of the Seine and, through the Belfort gap, into that of the Rhine. Thus it became the avenue through which blond northerners passed among southern brunettes. At the time of Roman world-colonization its low-lying territory allowed the civilization of Rome to penetrate into Gaul. Through the Mediterranean at its southern end and the Seine emptying into the Channel at its northern extremity it conveyed Mediterranean culture into the very heart of England.

In the same way the function of the remaining three breaches has been that of bringing north and south together. Through the Bosporus-Hellespont gap the life of Russia's southwestern plains was drawn, albeit imperfectly, into Mediterranean activity, while countercurrents of southern thought traveled slowly northward. The penetrability of orographic barriers to civilization is made clear by such detailed description. It is to be hoped that a study of the southern breaches from the same pen may soon be available.

AFRICA

Condition of the "Cape-to-Cairo" Route. The route of the ''Cape-to-Cairo'' transportation system has been surveyed in its entirety and is actually short of completion by only three comparatively short links (*Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 64a). On the two unconstructed railroad links, both in the Congo, work has been suspended since the outbreak of the war. One of 155 miles from Tshilongo to Bukama is required to put the latter place in rail communication with Cape Town, distant 2,620 miles. From Bukama, river navigation, with two short railroad sections avoiding the rapids between Kongolo and Kindu and between Ponthierville and Stanleyville rapids, extends to Stanleyville and the beginning of the second unbuilt section of about 548 miles to Mahagi on the western shore of Albert Nyanza. From thence Uganda Government steamers will be operated to Khartum, in which section the only hindrance to navigation is the rapids between Rejaf and Dufile. This will be removed by the construction of a lock instead of by the railroad line at first proposed. From Khartum Sudan Government trains and steamers and the Egyptian Railway complete the route to Cairo and Alexandria. The transcontinental route across tropical Africa from east to west was opened during the early part of 1915 (see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 449-450 and p. 959) but is now closed on account of military necessities.

Effect of the War on South African Trade. According to Laite's Commercial Blue Book for South Africa, 1915 (pp. 181 and 321), the war has had a remarkable effect on the reduction of exports. The reduction in value of exports for the first seven months of the war amounted to $102,500,000. This was largely due to the fact that it was not deemed safe to ship raw gold, diamonds, and wool, though the inconvenience, as far as gold was concerned, was nullified by an arrangement with the Bank of England, which negotiated bills on the same basis as though gold had been shipped. Another element in the reduced exports was the complete collapse in the demand for ostrich feathers, a trade that was weakening before the war and was paralyzed when hostilities began. Thus South Africa stands out with greater prominence than ever as a distinct economic unit, in many respects unlike the temperate regions of South America or Australia. Their exports are still in demand, for they belong almost exclusively to the class of necessities for Europeans. (See also the articles by A. L. Bishop and Mark Jefferson on the effect of the war on world and on American trade in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 641-651, and the article in this number on "Trade Movements and the War.")

ASIA

Land Routes to India. As a consequence of the campaign being carried on in Mesopotamia, the possibility of a Turco-German drive to India is suggested by Talcott Williams under the caption "Can Germany go to India?" in the January number of the *Review of Reviews*. The writer takes into account the several routes to India and points to the main caravan route through Persia and Baluchistan as a likely path for an invading force. For this he has assumed that the Bagdad line is completed and, this being insufficient, he further assumes that the building of branch lines to Sulemanieh and Hanikin are being pushed vigorously.

Perhaps the writer is over sanguine in his estimation of the rapidity with which these Turkish railroads can be built. His reproduction of our Society's map of Turkish railroads published in the December issue of the *Bulletin* shows the Bagdad line in operation, although the original merely indicated that it was under construction. Mr. Williams' assumption is based on news conveyed to him by a nameless wanderer from Mosul. Nevertheless, he would have been much nearer the truth had he chosen to abide by the Society's carefully prepared map, which was brought up to date of December 1, 1915, and not merely to August 1, 1914, as he has stated. A casual reference to the Gaza line, shown completed to the Egyptian border, would have indicated this.

But supposing the line to be completed, although it is doubtful whether 1916 will witness the event, the transportation of a German or Turkish army to India over it makes better reading than practical working. Thirteen hundred miles of some of the most sterile land in the world separate Mesopotamia from India. Far from being a causeway between these two fluviatile regions, the plateau of Iran would probably be the grave of an expeditionary force marching eastwards. Its central caravan route is merely a narrow strip in which fresh water is occasionally met, though not in the quantities required by a modern force on the march. It may be negotiated satisfactorily, yet ever arduously, by a string of thirty-odd camels and their attendants. But to send an army over this route is another undertaking. The real danger to India, if any, lies in native uprising rather than in land attack by German or Turkish forces.

Opening of Pukow Harbor. Pukow, a Chinese seaport on the north bank of the Yangtze River, directly across from the city of Nanking and 205 miles from Shanghai, has been opened to foreign residence and trade by the Chinese Government, according to information from Consul J. Paul Jameson in *Commerce Reports* for January 17, 1916. The port lies in the province of Kiangsu and consists of the three small islets of Yung Seng Chow, Chin Foo Chow, and Liu Chow. It has the advantage of being accessible at all times of the year and may on this account prove to be a serious rival of Hankow's traffic.

A large amount of freight is expected to reach Pukow through the Tientsin-Pukow railway, which traverses the fertile agricultural districts of Anhui and southern Kiangsu, the mining and farming districts of northern Kiangsu and Shantung, and the cotton-raising districts of Shantung and Chihli provinces. The productive northwest region of China is also tapped by the line through its connection with the Peking-Hankow railroad.

Irrigation Societies in the Philippines. An interesting condition of primitive societies and one illustrating the similarity of human institutions in widely separated regions is exemplified by the organization of irrigators in some of the Philippine provinces, as described in a recent paper by Emerson B. Christie (Notes on Irrigation and Co-operative Irrigation in Ilocos Norte, *Philippine Journ. of Sci.: Section D,* Vol. 9, 1914, No. 2, pp. 99-113). Here are considerable areas of land under irrigation, mainly devoted to the growing of rice. The works, though effective, are crudely constructed, being the result of efforts continued through generations. Water is diverted from the streams usually by low temporary dams of bamboo and rock. The ditches as a rule are well constructed and show good maintenance. Water is conducted by gravity, few, if any, mechanical devices being in use. The people who built and operated these works can rarely read and write, but they have developed forms of organizations which are quite complicated and, at the same time, effective. The agreements recite certain definite understandings and are drawn up and signed by each individual water user, usually by a cross.

The interesting point is that these agreements among semi-civilized people are similar to those which have existed for several generations in the southwestern part of the United States among the town-dwelling Indians and the neighboring Mexicans who have settled along the Rio Grande and its tributaries, and other similarly situated rivers. The documents recite the conditions which are to be fulfilled and the penalties for evasion of duty by any one of the members of the community. A chief is chosen each year by popular vote, and his orders with respect to the operation and maintenance of the irrigation system are to be obeyed. Each person is to appear for work at the designated time or he will be fined for failure to perform his part. The penalties, while not extreme, are adequate to insure fairness and bring about a proper sharing of the difficulties as well as of the advantages. The existence of such understandings in widely separated parts of the world and the fact that they have been in force from time immemorial demonstrates the practicability of effective community work among these people of similar education and experience. It is also interesting to note that, as in more highly developed societies, there are ever-present dangers of one man of unusual energy or ability dominating in the division of benefits. Provisions are made to meet these conditions; for example, the elected chief is forbidden to enter into contracts without first submitting the proposition to a meeting of the society. Another provision forbids a member alienating his share without the consent of his fellow-members. In these societies as elsewhere the chief difficulty arises in the protection of the rights of the weaker members and in the fair distribution of the water to all entitled to it. The favored safeguard seems to be in the annual choice of a chief and in the provisions which in effect require a full publicity as to all actions taken.

F. H. Newell.

AUSTRALASIA AND OCEANIA

Physiognomy of Western Australia. A great part of the state of Western Australia, comprising an area equal to that of the United States east of the Mississippi River, is a characteristically arid land. Its general surface is a vast, even, slightly tilted, and recently uplifted plain, the high points of which are 4,000 feet above sea-level. A quite notable feature of this desert tableland is the remnant of an old peneplain which still persists, even near the sea, where the climate is rather moist. In the interior the old peneplained surface seems to have been all but completely obliterated by the work of the new cycle of erosion. According to the conclusions recently drawn by Mr. J. T. Jutson (An Outline of the Physiographical Geology of Western Australia, *W. Austr. Geol. Surv. Bull. 61,* Perth, 1914), after an exhaustive study of this country, the present relief expression of the region is mainly, if not solely due to wind erosion, and a new plains-level is at the present time being developed at an angle to the old one.

It thus appears that the arid great plateau of Western Australia, like the high plains of the South African veldt and the Mexican tableland, is a vast area wherein regional leveling and lowering is now going on without any near approach to baseleveling. Nowhere else on the face of the globe are the relative efficiencies of the different erosional processes displayed in so remarkable a manner so near together as in Western Australia. Marine planation, stream corrosion, and general wind-scour are vigorously at work upon the destruction of the old tilted peneplain. Their potencies appear to be inverse to the order mentioned. Charles R. Keyes.

The Latest Eruption of Mauna Loa. Further notes on the outbreak of Mauna Loa from November, 1914, to January, 1915, are given by Dr. T. A. Jaggar, Jr., in the *American Journal of Science* (Vol. 40, No. 240, Dec., 1915, pp. 621-640). The events of the period of seismic prelude as well as the observations taken during the outbreak re recorded. The activity of the volcano is considered a preliminary summit ebullition f the same type as that which preceded former eruptions. The case of the great Hilo low of 1880-81, which came as a sequel to the eruptive period of May, 1880, is cited ogether with other occurrences of approximately similar periodicity.

The relation of this volcano to Kilauea still awaits determination. It has been bserved in general that the subsidence of Kilauea lava to smoky depths corresponds to paroxysmal period at Mauna Loa. A complicated system of interdependence between he two volcanoes may possibly manifest itself by alternations of eruption. The rise of Kilauea corresponding to the Mauna Loa outbreak may be interpreted by this assumpion. The possible existence of a subterranean connection is found in the occurrence f gas-impelled fountains of lava foam detected before the rise of the lava column from he Mauna Loa vent 10,000 feet above the level of the mouth of Kilauea.

No manifestations of activity after the eruption were noted from January to June, 1915. After the summer solstice, however, thin smoke was detected occasionally. A slight rise of Kilauea lava was also observed in June. It is not to be expected that lava will flow from the flanks of the volcano for some years.

PHYSICAL GEOGRAPHY

Sunspots and Atmospheric Pressure. Von Hann, Blanford, and Fritz have discussed the effect of sunspots on atmospheric pressure, with generally rather unsatisfactory results. So far as India is concerned, Blanford did present some fairly good evidence tending to show that at times of sunspot maxima the pressure in the Indo-Malayan region is high, while that in European Russia and western Siberia is low. Dr. Gilbert T. Walker, Director-General of Indian Observatories, discusses sunspots and pressure in his sixth paper on ''Correlation in Seasonal Variations of Weather'' (*Mem. Indian Meteorol. Dept.*, Vol. 21, Pt. 12, 1915). The data relate mostly to the years since 1850, and the correlation coefficients are charted. Comparison of this chart with the corresponding one, previously published by Doctor Walker, for sunspots and rainfall, shows the general tendency of the pressure coefficients to be of opposite sign to the rainfall coefficients. It is inferred that the variations of pressure and rainfall are to a large extent dominated by the same cause and are comparatively little affected by variations of temperature. Further, the relation between sunspots and temperature seems to be brought about rather by excess of humidity in the air, at any rate in its higher levels, than by excess of rain. Doctor Walker regards it as premature to discuss in detail the causes that are at work in the relation of sunspots and pressure until the data of certain other elements have been analyzed. Future publications dealing with Doctor Walker's further investigations of this highly important subject will be awaited with interest.

R. DeC. Ward.

HUMAN GEOGRAPHY

Geographic Influences in the Field of Science. In a presidential address delivered at the eleventh annual meeting of the Association of American Geographers and reproduced as the leading contribution to the fifth volume of the Association's *Annals*, Prof. A. P. Brigham has marshaled a host of facts which bring out the all-pervading nature of geography. His views may be summed up by stating that before looking into any form of activity we should look at the land in which it is manifested. Geography thus becomes the science of foundations. It is to be regarded as a parent-science rather than a sister-science.

Treating of geography and American character, Professor Brigham points to the necessity of taking ancestral environment into account. Thus the New Englander is, to a certain degree, the product of the surroundings in which his forebears moved prior to their emigration to America. The spirit of Jute or of Viking rovers enters today into the character of many a Vermont farmer or British Columbia rancher. The extent to which such prenatal influences prevail in the individual cannot be determined. But the past lives in the present, and this is the triumph of will over unthinking nature. The Puritan on the rocky northeastern coast of the United States did not succumb to environing inhospitality but brought long inherited energy into action upon his new American home.

The exploitation of the field of regional geography is strongly urged. This is the day of intensive studies. The United States' field is full of possibilities. The sowing of a healthy seed was begun four centuries ago, and the harvest season cannot be much delayed. Physiographic and historical material abounds for the eastern United States. The Coastal Plain, the Piedmont, or the Great Appalachian Valley, are topics suggested. The name of every state in the Union ought to be placed on the list. Our great river valleys, a unit like Long Island, likewise lend themselves admirably to this treatment.

The paper is notable for its breadth of scholarship, its closely organized form, an its sanity and suggestiveness. It would be a great gain for geography if there were general emulation of the author's charming literary style. The only criticism of the paper grows out of the too close adherence in the opening paragraphs to theories of evolution now superseded or at least strongly modified by the recent anthropologica work of Ripley, Elliot Smith, and Osborn.

Weather and Human Health and Activity. More and more attention is being paid to the relations between the weather and man's mental and physical condition The medical profession has long recognized the importance of this matter, but it is only in recent years that careful statistical inquiries have been made, by meteorologists and others. An investigation of this character has lately been carried out, with the assistance of the Vienna Academy of Sciences, by Drs. Wilhelm Schmidt and Ernst Brezina (*Sitzungsber. Wien. Akad. Wiss.: Math.-naturwiss. Kl.*, Vol. 123, Sect. III, 1914, pp. 209-291). The authors point out the need of caution in any such study,—the danger of basing conclusions on occasional correspondence of what seems like effect and cause, and the importance of realizing that variations of some perhaps neglected or even unknown control may be the real cause of the phenomena with which we are dealing. The material used in the present investigation was the work of certain employees in the Census Office and of fifty classes of school children, and the statistics of epileptic attacks in a certain institution—all of these in Vienna. These reasonably abundant and comparable data were all carefully collected and ''accidental'' conditions allowed for, so far as possible. The meteorological data, which were probably the most complete yet used in any such investigation, were obtained from the official records of the Vienna observatory.

The most important conclusions are as follows: No single meteorological element included in the investigation has a preponderating influence on man's health and activity. Moderate intellectual activity seems at its best when the pressure is constant. Short and rapid pressure changes (4-20 minutes) of considerable amplitude are associated with unfavorable conditions of intellectual work, and with epileptic attacks. Intellectual work is diminished by high temperatures (plus temperature departures lasting two or three days). The ozone content of the air seems to have practically no effects, and wind has only very slight effects. Clerks and school children do their poorest work under weather conditions which prevail when the pressure is falling locally and rising in the west. The opposite relation holds for epileptics. R. DeC. Ward.

GEOGRAPHICAL NEWS

Organization of the Ecological Society of America. A meeting was held at Columbus, Ohio, on December 28th, 1915, at which it was decided to organize the Ecological Society of America. Dr. Victor E. Shelford, of the University of Illinois, is president of the new society, and Professor W. M. Wheeler, of Harvard University, is vice-president. Steps had been taken a year before to secure the views of animal and plant ecologists with regard to the formation of such a society, and the result was the enrollment of one hundred charter members and the rapid acquisition of over one hundred additional members in the fortnight following the organization meeting. The society will hold an annual session for the reading of papers and will organize field meetings from time to time in different parts of the country. The first regular meeting will be held in New York during Convocation Week of the present year. Field meetings have already been arranged to take place in the vicinity of Chicago in June, and at San Diego in August. The interests and activities of this society will be of the broadest character, embracing every phase of the relation of organisms to their environmental conditions, including the study of animal and plant geography. Those who are desirous of becoming members of the Ecological Society should communicate with the secretary-treasurer, Dr. Forrest Shreve, Tucson, Arizona.

The Revue de Géographie Annuelle. Back numbers of this valuable publication have been recently added to the Society's library, and the entire set is now available for consultation. The last volume issued is the seventh in the series. It contains papers published in 1913. Some might more appropriately be called monographs than articles. Volume 7 in particular contains three long and instructive studies bearing the following titles: ''Le Commonwealth d'Australie,'' ''Les Dépressions Continentales et le Climat du Tonkin,'' and ''La Basse Normandie.'' Volume 5 (1911) is of particular interest to American students because it contains a paper on the economic geography of Cuba. Volume 6 (1912) contains a French translation of Erland Nordenskiöld's detailed ethnographic study of the Indians of the Argentine and Bolivian Chaco (German edition listed in the September, 1915, *Bull. Amer. Geogr. Soc.*, p. 717).

Ten Years' Index to the Geographische Zeitschrift. This well-known Leipzig publication has just issued its "Register zu den Jahrgängen 1905-1914" prepared by Dr. Daniel Häberle. It is a systematic index, covering 160 pages, to the contents of the *Zeitschrift* for the ten years ending with Volume 20. Professor Franz Thorbecke prepared the index for the first ten years, and the two volumes make the entire content of this notable periodical easily available for all geographical workers.

PERSONAL

MR. WILL C. BARNES, of the U. S. Forest Service, spoke on February 11 before the Geographic Society of Chicago on "The Life of a Forest Ranger."

CAPTAIN JOSEPH E. BERNIER, according to press despatches from Quebec dated January 16, is planning another expedition to the Canadian Arctic. He proposes to start in July on his own ship, the *Guide*, and to be gone for two years. Captain Bernier will be remembered for his previous explorations in the American Arctic archipelago,—of interest geographically, because of the original surveys of the uncharted northwestern end of Baffin Island, and politically, because he was the officer who carried out the formal annexation by Canada of the whole archipelago.

PROFESSOR FRANZ BOAS, of Columbia University, spoke on January 24 before the New York Academy of Sciences on "General Ethnological Notes from Porto Rico."

MR. ANTHONY FIALA gave an illustrated lecture on January 14 before the Geographic Society of Chicago entitled "Through the Brazilian Jungles with Colonel Roosevelt." Mr. Fiala, it will be remembered, was a member of one of the three parties into which the Roosevelt-Rondon Expedition separated to reach the Amazon. His route followed the Papagaio, Juruena, and Tapajoz Rivers (see map in this number on page 171).

CAPTAIN GRANVILLE FORTESCUE lectured on February 2 before the Geographical Society of Philadelphia on "The Dardanelles and the European War."

PROFESSOR A. W. GRABAU, of Columbia University, gave a paper on January 3 before the New York Academy of Sciences on "Some Parallelisms in the Geology of Western Europe and America."

PROFESSOR D. W. JOHNSON, of Columbia University, spoke on January 3 before the New York Academy of Sciences on "The Strategic Value of Landforms in the Great Russian Retreat." The lecture discussed substantially the same topics as Professor Johnson's paper in the February *Review*. On February 11 Professor Johnson addressed the members of the United State Naval War College at Newport, R. I., and, a week later, the students of Mount Holyoke College on "Topographic Features of Europe as a Factor in the War."

DR. FRANK E. LUTZ, of the American Museum of Natural History, spoke on February 15 before the New York Entomological Society on "Centers of Dispersal and Their Bearing on the Present Distribution of Animals."

MR. NORMAN TAYLOR, of the Brooklyn Botanic Garden, is giving a course on phytogeography at that institution. The course deals with plant distribution over the earth. Prerequisites are courses in plant ecology and geology and a good general knowledge of climatology and systematic botany.

PROFESSOR WILLIAM I. THOMAS, of the University of Chicago, spoke on January 28 before the Geographic Society of Chicago on "The Comparative Mental and Moral Worth of Races."

MR. EUGENE VAN CLEEF, of the Duluth (Minn.) State Normal School, spoke on "Our Debt to Climate" at a geography round table at a meeting of the Northeastern Minnesota Educational Association on February 18.

DR. LUCY L. W. WILSON, of the Philadelphia Normal School, on January 19 gave an illustrated lecture before the Geographical Society of Philadelphia, entitled "Climate and Prehistoric Man as Revealed in Recent Excavations in New Mexico."

OBITUARY

PROFESSOR EUGENE W. HILGARD died on January 8 at the age of 83. Since 1904 he had been emeritus professor of agriculture at the University of California. The breadth of treatment and attention to causal relationship resulting from Professor Hilgard's equal proficiency in geology and agriculture gave his work a distinctly geographic character. The fundamental "Report on Cotton Production in the United States," published in 1884 by the Tenth Census, was prepared under his direction; he himself contributed the general discussion of cotton production and the sections devoted to Louisiana and Mississippi, each preceded by a summary of the physical geography of the state. From 1855 to 1873 he was state geologist of Mississippi; to this period belongs his ''Report on the Geology and Agriculture of Mississippi,'' 1860. For thirty years, from 1874 to 1904, he occupied the chair of agriculture at the University of California. In 1881-83 he was in charge of the agricultural division of the Northern Transcontinental Survey along the Northern Pacific Railway; his observations were laid down in a ''Report on the Agricultural Features of the Pacific Slope,'' 1882. His last work, ''Soils: Their Formation, Properties, Composition, and Relation to Climate and Plant Growth in the Humid and Arid Regions,'' 1907, is a standard contribution to the subject in English.

VICTOR HUOT, the cartographer of the Paris Geographical Society, was killed in battle on April 28, 1915, at the age of 48. Prior to his connection with this society, he had contributed to all of the map publications of the firm of Hachette et Cie., notably the ''Atlas Universel de Géographie'' by Vivien de Saint Martin and Schrader. In addition to his regular compilations for *La Géographie,* the organ of the Paris society, he prepared a set of river-basin maps of the French Alps for the water and forest commission of the Service des Grandes Forces Hydrauliques and wrote the section on South America in the recent ''Grande Géographie Boug'' published under the direction of Onésime Reclus.

PIERRE LEROY-BEAULIEU was killed in action near Soissons on January 13, 1915, aged 44. A son of the famous French economist, he had mainly devoted himself to economic geography, occupying the chair of commercial geography and statistics at the École Libre des Sciences Politiques and the chair of political economy at the Collège de France. His ''Les États-Unis au XXe Siècle,'' 1914, is one of the foremost foreign discussions of the economic geography of our country. In his ''Les Nouvelles Sociétés Anglo-Saxonnes: Australie, Nouvelle Zélande, Afrique du Sud,'' 1901, he lays greater emphasis on political and social conditions.

SIR CLEMENTS ROBERT MARKHAM died in London on January 30, 1916. The little village of Stillingfleet, where he was born in 1830, records in its name the disembarkation there of the fleet of the Norseman Harold Hardrada. The historic incident suggests itself appropriately, for Sir Clements Markham's was a voyaging spirit akin to that of the ancient seamen. His travels, beginning at the early age of fourteen, extended from Arctic shores to African plateaus, Indian plantations, and Peruvian valleys. Happily all are recorded by his facile pen. To our geographical literature of the Arctic he contributed ''Franklin's Footsteps,'' 1852, and ''The Threshold of the Unknown Region,'' 1874, based on his early experience with the Franklin Search Expedition of 1850-51 and a later journey to Greenland with the Nares Expedition. Indirectly the cause of Polar exploration owes much to his influence and interest. To him was due in large measure the financing of Captain Scott's Antarctic expedition of 1901. ''A History of the Abyssinian Expedition,'' 1869, relates the interlude of African travel, but his chief labors have been devoted to Peru, the land of his first voyaging. In the preface to one of his latest publications, ''The Land of the Incas,'' he tells how, a naval cadet stationed on the Pacific coast, he fell under the fascination of the Andean land and how, stimulated by Prescott, he seized his first opportunity to return and engage in research on Inca civilization. An early result appeared in 1856, ''Cuzco and Lima.'' A few years later he returned again, on this occasion under orders from the Government of India to procure cinchona plants from the Peruvian *montaña* for introduction into British India. While prosecuting this object he traveled many leagues of unknown country in the ''golden valleys'' of Caravaya. A memoir of the Countess of Chinchon details the history of the valuable plant, and ''Travels in Peru and India,'' 1862, the success of his important mission. The explorer's versatile energies enabled him to render services to the executive of the Hakluyt and Royal Gographical Societies. To both he acted in turn as secretary and president for considerable terms. For the former he edited twenty-two volumes, among them his critical translations of the works of the Peruvian historians Cieza de Leon, Garcilasso de la Vega, Acosta, Sarmiento de Gamboa, and others. To the Royal Geographical Society Markham acted as secretary for twenty-five years and president for twelve (1893-1905), and his contributions to the *Geographical Journal* number some seventy papers. Of him it may be truly said that, without intermission, through a long and splendid lifetime he responded to the Society's behest ''ob terras reclusas.''

HERMANN GRAF ZU SOLMS-LAUBACH died on November 25, 1915, at the age of 73. To geographers he is best known through his brief exposition of the principles of plant geography, ''Die leitenden Gesichtspunkte einer allgemeinen Pflanzengeographie,'' 1905. He had also written a paper on the origin, domestication, and distribution of the fig-tree (*Abhandl. Gesell. Wiss. Göttingen,* Vol. 28, 1881).

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the January number, pp. 57-61.

NORTH AMERICA

General

KAWAKAMI, K. K. **Asia at the Door: A Study of the Japanese Question in Continental United States, Hawaii, and Canada.** With a prologue by Doremus Scudder and an epilogue by Hamilton W. Mabie. 269 pp. Fleming H. Revell Co., New York, 1914. $1.50. 5½ x 8½.

"Aside from the conflict of capital and labor, the greatest problem of the age, and of ages to come, is that resulting from contact between the East and the West. Of this great problem the Japanese question in America is . . . a small fragment." In these grave words Mr. Kawakami sums up the substance of his book. He is a Japanese who has lived long in America and has an American wife. He has become so thoroughly and genuinely Americanized that he not only speaks of how "*we*" have treated the Japanese and other "foreigners," but actually refers to "*our* Pilgrim forefathers." His plea is that the Japanese have never had a fair chance in America. This he proves by almost numberless instances. We have said to the Japanese that they must keep out because they are Asiatics. What Mr. Kawakami protests against "is the false notion that all Asiatics are 'undesirables,' while all Europeans are 'desirables.' Physiognomy, stature, and the color of the skin have no more bearing upon the moral character and intellectual quality of a man than the pattern of the garments he wears."

It is hard to dispute this statement. It is hard to prove that the Japanese are not at least as valuable citizens—the word seems ironical—as the Italians, Armenians, Turks, and Syrians who are admitted to our country and our citizenship without question. It is equally hard to prove that they are not willing to become Americanized. We have done all that we can to prevent them from liking us and from adopting our ways. If they retain their own habits we accuse them of not being willing to be Americanized; if they adopt our clothes and try to live our life we rail at them as cocky and bumptious. If we would treat them as we treat other foreigners, they would quickly become like the rest of us. That is the author's main contention. He even goes so far as to advocate intermarriage. He agrees that where drunken sailors are the fathers of children by outcast Japanese women the result is far from good, but where Japanese and Caucasians of good social position and similar ideals are married the homes "are usually happy, and the children . . . are both healthy and bright. In appearance, in temperament, in manner, such children [when living in America] are so completely American that one can hardly detect Japanese blood in their veins."

Mr. Kawakami is everywhere fair and courteous. He frankly admits the faults of the Japanese. He pictures both the good and bad sides of their life in America. He admits that we would be better off without some of them. At the same time he shows that they are no worse than other people including ourselves. His touch is gentle, but the claws prick at times and make the loyal American blush with shame that we should be so arrogant when we have so much that we could wish to conceal.

The races of the world are moving today as never before. We cannot keep them still. The Japanese and Chinese want to come here, we want to go to tropical lands and exploit them, the people of Europe want to go to Canada, Australia, Argentina, and many other places, and every energetic race wants to take its share in developing the undeveloped parts of the world. The result is that people are thrown out of adjustment, politically, socially, and physiologically. That is one of the causes of the European war, of our labor troubles, of our problems of vice, crime, imbecility, and of many other evils.

The way in which a new environment may possibly alter the character of a race may well cause us to pause and consider. Listen to this: "Dr. Edward A. Steiner, one of the foremost authorities on the immigation problem, in a recent address at Saint Louis sees the real menace for California not in Oriental immigration, but in the ebbing energy of its citizens. The pioneers of California who conquered all obstacles offered by nature were energetic, undaunted, and willing to toil. But the present generation, Dr. Steiner points out, is beginning to seek pleasure, avoid parenthood, and shirk hard work. And many Californians plainly admit that their young men no longer soil their hands with the tilling of the earth, but migrate to the cities in que of gentleman's work and easy money. The effect of this tendency is clearly shown i the census of 1910, which records considerable decrease in the farm lands in Californi Some American writers go even so far as to assert that this very symptom of weakne on the part of Californians is one of the causes which brought about the agitatio against the Japanese. . . . People begin to hate other races only when they are doubtf of their own superiority. The southern aristocrat never hated the negro; it was onl those poor whites who were not so sure of their superiority that hated him.''

We may not agree with all Mr. Kawakami's conclusions, but his book deserves caref study. The adjustment of race to race, and of races to new environments, is not eas and light is needed from every available source. ELLSWORTH HUNTINGTON.

ALASKA

—— **Alaska, Natives of, Report on the Work of the Bureau of Education fo the.** iv and 52 pp. Map, ills., bibliogr. *Bur. of Education Bull. No. 48.* Washingto D. C., 1915. [The broad range of educational activities in Alaska includes medical an sanitation work, to which is devoted 18 per cent of the total appropriation funds promotion of industries and of co-operative and self-governing institutions; supervisio of trade in fur, much more profitable to natives when it can be accomplished with th intermediary of a local trader; distribution of reindeer, now 66 per cent native-owne and supervision of the industry. The reindeer herd during the year made a net increa of 22 per cent, and a trial shipment of meat was submitted to Seattle.]

KEEN, DORA. **Exploring the Harvard Glacier.** Ills. *Harper's Magazine,* Vo 132, 1915, Dec., pp. 113-125.

CANADA

Yukon, Northwest Territories, British Columbia

CONNOR, A. J. **The Temperature and Precipitation of British Columbia.** 90 p Map, diagrs. The Meteorol. Service of Canada, Dept. of Marine and Fisheri Toronto, 1915.

Director R. F. Stupart, of the Canadian Meteorological Service, plans to issu from time to time, a series of ''booklets'' upon Canadian climates, under the editorshi of Mr. A. J. Connor, the climatologist of the Service. All the data obtainable fro meteorological observations made in Canada during the last seventy or more years w be analyzed and published in synoptic form, with discussion. The first of this ne series deals with the temperature and precipitation of British Columbia. It is introduc by a map of British Columbia, showing the different climatic districts; a clear an striking plate giving the types of seasonal precipitation, in colors, for selected station fifteen in all, in the different climatic districts; and a second plate giving curves, i colors, of types of mean temperature and of mean daily range of temperature, for fo stations, with the London curves added for purposes of comparison. The similarity o the London curves with those for British Columbia is striking. We are glad to see th map and these diagrams at the very beginning of the report. The reader starts off wit a good general idea of some of the essential characteristics of the district before h reads a word of the discussion or has even glanced at the numerical tabulation. Th author gives a clear and systematic account of the various climatic subdivisions, payin special attention to the seasonal means. At the end, the monthly, seasonal, and annu means and extremes of temperature and of precipitation are given in full for all th stations, the data for each station occupying one full page, which makes the tabulatio clear and easy to use.

The first number of Doctor Stupart's new series is an excellent one. The secon report will deal with the rich agricultural provinces of the Northwest and therefore wi be of special interest to geographers. R. DEC. WARD.

ALLAN, J. A. **Parks in the Canadian Cordillera: Physical Features an Attractions in the Canadian National Playgrounds.** Ills. *Scientific America Suppl.,* No. 2083, Vol. 80, 1915, Dec. 4, pp. 360-362.

GOSNELL, R. E. **The Year Book of British Columbia and Manual of Provincia Information (Coronation Edition).** Ills., index, addenda. 406 pp. Published b authority [of the] Legislative Assembly, Victoria, B. C., 1911. $1. 9 x 6. [Addend pp. 359-406, have been added to the 1911 edition, bringing it down to 1914.]

Pre-Emptor's Map of British Columbia. 1:190,080. Sheets: Bulkley; Fort George Graham Island; Lillooet; Nechako; Quesnel. Department of Lands, [Victoria], 1915.

Topographical map of the Rocky and Selkirk Mountains. 1:125,000. Department o the Interior, [Ottawa], 1914.

Alberta, Saskatchewan, Manitoba

—— **Climatic and Soil Conditions in the Canadian Pacific Railway Com-ny's Irrigation Project, Western Section (near Calgary, Alberta), Report on the.** pp. *Irrigation Series Bull. No. 3.* Dept. of the Interior, Ottawa, 1915. [Abstracted the February number under "Irrigation in Alberta," pp. 141-142.]

—— **Duty of Water Experiments and Farm Demonstration Work.** 62 pp. iagrs., ills. *Irrigation Series Bull. No. 4.* Dept. of the Interior, Ottawa, 1915. 3y "duty of water" is meant the amount of water needed to supplement rainfall in rigated areas. The report covers the work done in southern Alberta and Saskatchewan ıring the summer of 1914.]

UPHAM, WARREN. **Revision of the Map of Lake Agassiz.** *Journ. of Geol.,* Vol. , 1915, No. 8, pp. 780-784.

Saskatchewan, map showing disposition of lands. 1:792,000. Railway Lands Branch, ept. of the Interior, Ottawa, 1915.

Southern Alberta, map showing disposition of lands. 1:792,000. Railway Lands ranch, Dept. of the Interior, Ottawa, 1914.

UNITED STATES

General

ILLIS, H. A. **Some of the Economic Aspects of Japanese Immigration.** *Amer. Econ. Rev.,* Vol. 5, 1915, No. 4, pp. 787-804.

The earlier struggle over Chinese immigration and the more recent struggle over e immigration of Japanese laborers arose chiefly from conflicts of standards involved especially of economic standards. The volume of Japanese immigration has been nall; only in California did these people ever form as much as two per cent of the pulation. The economic effects of Japanese immigration are shown in only a few cupations. The writer's main conclusions are:—"1. The discharge of others to give nployment to Japanese was exceptional; for the greater part they were employed to l vacancies and to supply the deficiency of laborers. . . . There was, nevertheless, nsiderable displacement incidental to the absorption of Japanese laborers. 2. The neral effect of their employment was to retard the increase in wages. . . . 3. The gmentation of the labor supply, the low wages required, the convenience of the ganization maintained for securing employment, and the efficiency of the Japanese . aided in the development of Western industries. 4. By stimulating industry, and by using the labor cost to be lower than it would otherwise have been, the effect was increase the profits of employers. 5. The Japanese have made good progress as rmers and as shopkeepers, and in some instances their competition has tended to reduce ofits. 6. Though there are exceptions, the general effect of the employment of panese as agricultural laborers and of Japanese farming was to increase land values, retard the subdivision of large tracts, and to deflect to other localities the tide of migration to the West." AVARD L. BISHOP.

LMER, BEN. **Swamp Land Drainage, With Special Reference to Minnesota.** 138 pp. Index. *Univ. of Minnesota Studies in the Social Sciences No. 5.* Minneapolis, 1915. 10 x 6½.

ILLIAMS, I. A. **Drainage of Farm Lands in the Willamette and Tributary Valleys of Oregon.** 81 pp. Ills. *The Mineral Resources of Oregon,* Vol. 1, 1914, No. 4. Oregon Bur. of Mines and Geol., Portland. 10½ x 7.

Two dissertations advocating land drainage to increase productivity. The first conlers what has been accomplished in various countries and compares with it what s been done in the United States, more particularly in Minnesota. Mr. Palmer gives rather comprehensive view of land drainage in our country. He impresses the reader th the vast work involved in draining all our lands that are now swamp. Federal operation is essential. The author says it would be "economically foolish" not to ain in each case the "whole basin or watershed involved"; and, since "the greater rt of our swamp reclamation problems are interstate," the work of one state lependent of the neighboring state will fail to give permanence to the drainage work omplished. The drainage laws of the states, data for Minnesota, and a bibliography given.

Mr. Williams shows that though the Willamette Valley has been disappointing to ny farmers who do not know just how to handle their lands, proper drainage, not cessarily expensive, will make the valley very desirable. For one who is not familiar th drainage methods, a better text-book could hardly be desired.

EUGENE VAN CLEEF.

North-Central States

ROBINSON, E. VAN D. **Early Economic Conditions and the Development of Agr culture in Minnesota.** vi and 305 pp. Maps, diagrs. *Univ. of Minnesota Stud in the Social Sciences No. 3.* Minneapolis, 1915. 13½ x 10½.

A book which will be of great service to workers in the history, economics, an geography of Minnesota. Its most important feature is a series of over two hundre maps and graphs which make up an atlas of Minnesota agriculture. Of special intere to the geographer are dot maps which show the production and, for recent decade the acreage of the leading crops for each decade from 1850 to 1910. The statistics fro which they are made are included in an appendix. A few maps should have had mo careful editing. Figure 106 on page 112 is an example. This map shows the numb and location of grist mills, saw mills, flax mills, and woolen mills in the state in 18 It shows no saw mills in Winona and Wabasha Counties and no grist mills in the latte At that time the city of Winona in Winona County was an important lumber cente and Wabasha County had both grist and saw mills.

In the preface the author recognizes the importance of geographic factors: "Sin all extractive industries are largely controlled by physical environment, a prelimina survey of topography, soil, and climate was clearly indispensable." Such a survey made in the opening chapter, but as much of the material covered by it is available more complete form in another recent state publication and as comparatively little u is made of it in the interpretation of the maps and graphs, it might have been omitt as a separate chapter and, instead, included as needed in the interpretation of t maps. Such a treatment would have meant a material increase in the effectiveness the exposition.

The remainder of the text outlines the history of Minnesota through the periods French and English occupation and traces the events which led to the rapid settleme of the state after 1852. It describes the influence which the development of transport tion on the Upper Mississippi River, the beginning of the lumber business, and t distribution of forest and prairies had in the development of agriculture and the sett ment of the state during the pioneer period. It analyzes the factors which led to state-wide adoption of a one-crop type of farming in the years from 1860 to 1880 a of those which in the next twenty years brought about a development of diversifi farming. Numerous citations to source materials and an excellent bibliography incre the value of the text.

CHARLES C. COLBY.

BALDWIN, A. L. **Triangulation in West Virginia, Ohio, Kentucky, Indiar Illinois, and Missouri.** 67 pp. Maps, diagrs., index. *U. S. Coast and Geod. Su Special Publ. No. 30.* Washington, D. C., 1915.

BARNES, B. A. **Geography in Detroit Elementary Schools.** *Journ. of Geo* Vol. 14, 1915-16, No. 5, pp. 144-150.

HUELS, F. W. **The Peat Resources of Wisconsin.** xvii and 274 pp. Ma diagrs., ills., index, bibliogr. *Wisconsin Geol. and Nat. Hist. Surv. Bull. No. Econ. Series No. 20.* Madison, 1915.

—— **St. Louis, Consular District of, Trade of the, Report for the Year 1 on the.** 35 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 55 London, 1915.

WEIDMAN, SAMUEL, AND A. R. SCHULTZ. **The Underground and Surface Wa Supplies of Wisconsin.** xxii and 664 pp. Maps, diagrs., index. *Wisconsin Geol. Nat. Hist. Surv. Bull. No. 35: Econ. Series No. 17.* Madison, 1915.

Michigan Island, Mich., mapped by Morgan H. Wright. 1:3,600. E. O. Wo Mackinac, Mich., 1915.

[Railroad] map of Nebraska. 1:633,600. Nebraska State Railway Commission, L coln, 1915.

South-Central States

BOLTON, H. E. **Texas in the Middle Eighteenth Century: Studies in Span Colonial History and Administration.** 501 pp. Maps, diagrs., index, bibli *Univ. of California Publ. in History, Vol. 3.* Berkeley, 1915.

This is an interesting study of frontier conditions. Up to the Louisiana Cess 1762, Texas was the northeastern outpost of New Spain. Its development was gover by French policy, actual and imminent. Spanish interest lay in maintaining the so what indefinite boundary west of the Mississippi; hence the colony was almost ex sively of the mission and presidio type, and directed to this end were the early crea of the easternmost post facing the French fort of Natchitoches and the rigorous trading laws. Any Frenchman found trading on Spanish territory without a license was committed to Acapulco and thence—an interesting bit of geography in itself—despatched to the farthest limit of the Spanish domain, to San Fernandez or Valdivia. Despite the law, the remoteness of this frontier prompted friendly relations between the rival posts, and one governor at least, Barrios, is strongly suspended of collusion with the French authorities in a profitable trading alliance.

In 1731, the beginning of the period under consideration, Spanish occupation was practically limited to a line of communications and three settlements along the belt of interior prairies, the home of the most amenable, agricultural tribes. The greater part of the shore line, peopled by hunting, fishing, cannibal tribes, was absolutely unknown until fear of English invasion led to the foundation by Escandón of the successful stock-raising colony of Nuevo Santander immediately south of the province of Texas; and fear of French aggression on the northern coast, to the creation of the fort and mission of San Augustin at the mouth of the Trinity River. At the same time an expansive period in the north and west was induced by a twofold motive: desire to subdue and proselytize the Apache and check the insiduous advance of French traders from beyond the Red River. With this object in view the San Sabá and San Xavier Missions were founded. Their long-lost sites have recently been identified by the author. Difficulties of controlling the nomadic hunting tribes of the splendid buffalo country of the West proved too great for the zealous fathers. The tentative hold of these and the coast missions and even the eastern post of Los Adaes is shown by their abandonment on the passing into effect of the Louisiana Cession. The only really successful missions was the central ones of the San Antonio. Spanish policy and geographic controls operated together to delay the European settlement of Texas.

Berry, E. W. **Erosion Intervals in the Eocene of the Mississippi Embayment.** Maps, diagr. *U. S. Geol. Surv. Prof. Paper 95-F*, pp. 73-82. Washington, 1915.

Cline, I. M. **The Tropical Hurricane of September 29, 1915, in Louisiana.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 9, pp. 456-466.

Rockwell, W. L. **The Water Resources of Texas and Their Utilization.** Map, diagrs., ills. *Texas Dept. of Agric. Bull. No. 43*, pp. 7-87. Austin, 1915 (?)

Railroad map of Kentucky. 1:456,000. Railroad Commission, Frankfort, 1915.

Geologic map of Tennessee, compiled by O. P. Jenkins, Assistant Geologist. 1:500,000. State Geological Survey, [Nashville], 1915.

State of Mississippi, compiled from official records of the General Land Office, U. S. Geological Survey, and other sources, under the direction of I. P. Berthrong. 1:760,320. General Land Office, [Washington], 1915.

Western States

Atwood, W. W. **Eocene Glacial Deposits in Southwestern Colorado.** 26 pp. Map, diagrs., ills., bibliogr. *U. S. Geol. Surv. Prof. Paper 95-B*. Washington, 1915. [Abstracted in this number, pp. 217-218.]

MEXICO AND CENTRAL AMERICA

Bauer-Thoma, Wilhelm. **Unter den Zapoteken und Mixes des Staates Oaxaca der Republik Mexico.** Ills. *Baessler-Archiv*, Vol. 5, 1915, No. 3, pp. 75-97.

Clum, H. D. **Nicaragua.** 15 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 43c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Dieterle, G. A. **De buitenlandsche handel van Guatemala.** *Tijdschr. voor Econ. Geogr.*, Vol. 6, 1915, No. 11, pp. 453-457. The Hague.

Lutz, Otto. **Beiträge zur Geologie des Panamakanals.** Diagr., ills., bibliogr. *Petermanns Mitt.*, Vol. 61, 1915, Sept., pp. 350-356; Oct., pp. 389-394. [A good summary of the geology of the isthmus, based mainly on the reports of Donald F. MacDonald, geologist of the Isthmian Canal Commission.]

Nida, S. H. **Panama and Its "Bridge of Water."** 196 pp. Maps, diagr., ills., bibliogr. Rand, McNally & Co., Chicago, 1915. 50 cts. 7 x 4½. [A supplementary reader for fourth and fifth grades.]

Palmer, Frederick. **Central America and Its Problems.** xiv and 347 pp. Map, ills., index, bibliogr. Moffat, Yard & Co., New York, 1913. $1.25. 8½ x 5½.

Snyder, A. G. **Panama.** 5pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 35b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Urbina, Fernando, and Heriberto Camacho. **La zona megaseismica Acambay-Tixmadeje, Estado de Mexico, conmovida el 19 de Noviembre de 1912.** 125 pp. Maps, diagrs., ills., bibliogr. *Inst. Geol. de Mexico Bol. Num. 32.* Mexico, 1913. [This zone, which lies in a disturbed and volcanic terrain, is the focus of the earthquake of Nov. 19, 1912. The quake was of tectonic origin and has aroused interest on account of its intensity and its location in a new center close to Mexico City.]

—— **Vera Cruz, Consular District of, Trade and Commerce of the, Report for the Year 1914 on the.** 12 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5522. London, 1915.

International railways of Central America. Map of existing, proposed, and subsidiary lines. [1:475,000.] [United Fruit Co., Boston], 1915.

Topographical map [of the] mineral concessions and lands [in Honduras of the] New York & Honduras Rosario Mining Co., by J. H. Sinclair, C. E. 1:12,000. N. Y. & Honduras Rosario Mining Co., [New York], 1911.

Mapa de Costa Rica, segun los levantamientos efectuados de 1891 a 1898 por H. Pittier, Director del Instituto Fisico-Geografico Nacional . . . Dibujado por el Asistente Enrique Silva R. 1903. Correcciones efectuadas hasta 1914. 1:500,000. [White-print copy by] United Fruit Co., [New York, 1915]. [A copy, without hypsometric tints, of the map that appeared in *Ergänzungsheft No. 175 zu Petermanns Mitt.* (reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 797-798).]

The district of Panama, by Percy W. Ryde, F.R.G.S. [4 maps]: (a) Before the canal, 1:150,000; (2) Present day, 1:150,000; [the other two are bird's-eye views to correspond to the above]. G. W. Bacon & Co., Ltd., London, [1915].

West Indies

—— **Cuban Tobacco Industry.** *South American Journ.*, Vol. 79, 1915, No. 23, pp. 457-458. London. [See also note on p. 219 on "The War and Cuban Commerce."]

Monaghan, J. C. **Jamaica.** 13 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 22c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Map of Porto Rico, compiled from the latest government sources by C. A. Reeds. 1:350,000. American Museum of Natural History, New York, 1915.

[Environs of San Sebastian, Porto Rico]. 1:100,000. [American Museum of Natural History, New York, 1915].

[Environs of Juana Diaz.] [18°6′-17°57′ N.; 66°33′-66°24′ W.]. 1:100,000. [American Museum of Natural History, New York, 1915].

SOUTH AMERICA

The Guianas, Venezuela, Colombia

Whiffen, Thomas. **The North-West Amazons: Notes of Some Months Spent Among Cannibal Tribes.** xvii and 319 pp. Maps, diagrs., ills., index, bibliogr. Duffield & Co., New York, 1915. $3. 9 x 6.

To appreciate Captain Whiffen's work it is necessary to recall that Crevaux, "the Stanley of South America," explored the great region between the Amazon and the Meta, a tributary of the Orinoco, as long ago as 1879-1881. Martius had been there in 1820. Humboldt, twenty years before, had entered the northwestern corner of the Amazon basin by way of the upper Negro, and several of the conquistadors had explored its borders. Crevaux had resolutely traversed it by way of two great streams,—the Guaviare on the north and the Putumayo on the south. From that time on, the great tract between these rivers remained unknown until Dr. Hamilton Rice in 1907-1908 and again in 1912-1913 made his noteworthy explorations of the Rio Uaupes, Rio Içana, and the Rio Inirida, thus tying up the main drainage courses with Bogotá on the northwest and the Rio Negro on the southeast (*Geogr. Journ.*, Vol. 44, 1914, pp. 137-168; cf. maps). Some of the bordering country is almost as new as the region which Doctor Rice explored. Between the Napo and the Uaupes, for example, there is a large tract of country which has been explored but little except along the streams. It is here that Captain Whiffen conducted his explorations and studies over a period of a year, 1908-1909. He was accompanied by John Brown, a Barbadian negro who had married a woman from the Witoto tribe on the Issa River. It was through this relationship that the author was able to gain most of his information.

The geographical elements of the book are not easy to get at because scattered through a mass of ethnological and other material, but as samples of interesting principles and facts the following may be given. The isolation of the forest is shown by the self-sufficiency developed by each group, which in turn has a marked effect upon the *mores.* For example, a man is prevented from ill-treating his wife by the fact that the other women would promptly make a song about it, and adverse opinion in a small self-contained group hostile to its neighbors is more efficient than any police force, whereas in a civilized community the wrong-doer may flee to another group, acquire new friends, and forget the past. Homicide within the tribe is not tolerated except for a capital offence, for if a man die it means the loss of a warrior: but these people live absolutely public lives, hence theft becomes a capital crime and an exception to the rule. The conditions of their forest life have led to the absence of laws of inheritance, since land is free for all to take who will. To our civilized ears it sounds strange to permit a man to take possession of land and the resources of the land at will but to suffer death for the theft of even a small object. The geographical distribution of dress is closely related to the geographical distribution of tribes and follows a regular progression, ''and there is no sudden change in passing from one neighboring tribe to another, although the tribal distinctions are very marked.''

A remarkable discovery was a drawing on bark cloth that is taken by the author to be the equivalent, among the Witoto tribe, of a map of the world. The map was made on beaten bark about two feet square. The center was divided into about a dozen squares, in which very crude human figures were represented fighting, planting, and hunting in their own territory. The dividing lines were of red vegetable pigment; on the margin were the sun, moon, and many stars.

Like other Amazonian tribes those of the northwestern Amazon country are required to break a fresh piece of ground after the second harvest, since the soil will produce but two crops in succession, though they return to the disused plantation for different palm fruits which continue to grow wild there. The qualifying test of a prospective husband and father is willingness to clear a plot of land and break and till the soil for a plantation. He need not qualify through house building, because he can share a corner in the great tribal house. For defense the Indians depend mainly upon the secrecy of the tribal dwelling, an easy matter in the absence of direct foot-paths. In addition, each tribe prepares a series of pitfalls in the forest avenues with poison stakes to impale the foe. The Indian paradise is upstream and not down because refuse is carried downstream.

The extent to which the Indian migrates is dependent upon the necessity for cultivating new plantations, for following game, and, in places, on the proximity of the white man. The migration of game is a serious matter for the Indian. Scarcity of animal life may even result in the abandonment of a homestead. Monkeys, one of the sources of food, are wanderers. When they have cleared one part of the forest of fruit and nuts they migrate to another.

The best photographs of native dances that have come out of this section of South America are contained in this book. Nothing so good has been published since Koch-Grünberg's ''Zwei Jahre unter den Indianern,'' 1909.

Paraguay, Uruguay, Argentina, Chile

Charlevoix, P. F. J. de. **Historia del Paraguay, escrita en francés por el P. —, de la Compañia de Jesús, con las anotaciones y correctiones latinas del P. Muriel. Traducida al castellaño por el P. Pablo Hernandez.** (Series: Colección de libros y documentos referentes a la historia de América, Vol. 17.) 455 pp. Index. Libreria General de Victoriano Suarez, Madrid, 1915.

This is the fifth volume in the Spanish edition of Father Charlevoix's famous ''Histoire du Paraguay.'' The authoritative nature of the work and its freedom from the gross exaggerations and absurdities of the time have always endowed it with pre-eminence. Shortly after its appearance it was translated into English and German. Spanish trans-ations were also commenced but suppressed in consequence of the national attitude towards the Jesuits. The present volume treats of Paraguayan history between the years 1717 and 1737, the period occupied by the rebellion of José de Antequera and the subsequent anarchies inspired by it. Antequera, described in no favorable terms by the historian, was a typical figure of his age, and Paraguay, the isolated and unstable, gave him fit opportunity to play the rôle of tyrant, precisely as it had half a century before afforded Cárdenas and was later to offer Francia and Lopez. Beyond the illustration of some of the profound effects of isolation, the volume contains little of geographical interest. Of the Jesuit reductions nothing is described save their sufferings. They were heavy enough—disbanded and recalled and disbanded and recalled again, their progress interrupted and their numbers diminished, yet the Provincial was able to supply without delay 12,000 Indians to the Governor of La Plata for his final attack on the rebels. One or two allusions reveal the jealousy with which the Fathers were regarded by their white and mestizo neighbors. The proposal to interdict their trade in yerba maté with Buenos Aires and Santa Fé is a specific instance.

—— **Paraguay, A Step in the Progress of.** Map, ills. *Bull. Pan American Union,* Vol. 41, 1915-16, No. 5, pp. 621-640. [The latest step in the economic development of Paraguay is the concession to an American firm for new port works at Asuncion.]

Puysegur, Enrique, and H. B. Pouysségur. **Expedición al Iberá.** Map, diagrs. *Anal. Soc. Científica Argentina,* Vol. 78, 1914, No. 5-6, pp. 241-258; Vol. 79, 1915, No. 1-2, pp. 35-64; No. 3-4, pp. 135-164. [Notes on the natural history, physiography, and geology of the practically unknown region of the Laguna Iberá of northern Corriente collected during the expedition of the Sociedad Científica Argentina of 1910. The first instalment of the article bears as signature the first name, the other two instalments, the second name.]

Plano geológico de la provincia de San Luis por el Dr. Enrique Gerth. 1:500,000. Accompanies "Constitución geologica, hidrogeología, y minerales de aplicación de la Provincia de San Luis" por el Dr. Enrique Gerth, *Anal. del Minist. de Agric.: Secc. Geol., Mineralog. y Min.,* Vol. 10, No. 2. Buenos Aires, 1914.

EUROPE

France

Siegfried, André. **Tableau politique de la France de l'ouest sous la Troisièm République.** 536 pp. Maps. A. Colin, Paris, 1913. Fr. 12. 10 x 6½.

This is a truly brilliant essay toward the establishment of the geographical facto in politics. The existence of this factor has been recognized by analysts of politica movements, but there has always been difficulty in extracting it from the tangle o motives which complicate the casting of a ballot. It can be operative only under a democratic system of government; it reaches its highest power under full manhoo suffrage; it is restricted again by the development of strong national parties in whic countrywide policies tend to outweigh local needs. In France the value of this facto is reduced by the limitations of the suffrage, but the absence of strongly dominan parties tends to enhance the operation of the geographical factor. Siegfried has take for the present study a sufficiently large area where the conditions are fairly uniform While we may not wholly accept the conclusions reached in this work, principally fo the reason that the geographical factor does not appear satisfactorily cleared of modify ing factors, yet we are to recognize the value of these results and to acknowledge tha the author has added to the analysis of great political movements a new method o criticism whose value will become greater and greater just in proportion as we acquir facility in its application. His analysis of the different regions of western France thu brought under historical and critical review is most scholarly. William Churchill.

—— **Calais, Consular District of, Trade of the, Report for the Year 1914 o the.** 13 pp. *Diplomatic and Consular Reports,* Ann. Series, No. 5524. London, 1915.

Carrigan, Clarence. **Nantes.** 7 pp. *Suppl. to Commerce Repts.,* Ann. Serie 1915, No. 5f. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Wash ington, D. C.

—— **Corsica, Trade of, Report for 1914 on the.** 7 pp. *Diplomatic and Consula Repts.,* Ann. Series, No. 5457. London, 1915.

—— **Havre, Consular District of, Vice-Consular Districts in the, Trade c the, Report for the Year 1914 on the.** 18 pp. *Diplomatic and Consular Repts* Ann. Series, No. 5531. London, 1915.

Riggs, A. S. **The Beauties of France.** Map, ills. *Natl. Geogr. Mag.,* Vol. 2 1915, No. 5, pp. 391-491.

Switzerland or the Alps

Weber, Julius. **Geologische Wanderungen durch die Schweiz: Eine Einführun in die Geologie. (Clubführer des Schweizer Alpen-Club.) Vol. 1: Mitte land und Jura.** 256 pp. **Vol. 2: Kalk- und Schieferalpen.** 377 pp. Ills., inde Rascher & Cie., Zürich, 1913(?) Mk. 2.40. 6½ x 4½.

In these litttle books the tourist who is a mere layman may find a valuable suppl ment to his Baedeker. Volume 1 opens with a synopsis of the rock species of Switze and, describing the sedimentary rocks—mechanical, chemical, and organic; eruptive ocks, crystalline schists; the succession of the stratified rocks; the geological ''zones'' f Switzerland; and even touches upon geomorphology. The volume contains much of alue in condensed form. While the tourist's guide book will direct him to the nunicipal museum of Solothurn, with its natural history collection where he may see nteresting fossils from the Jura, including giant tortoises, this little book leads him o the limestones where he may find them. Volume 2 gives many geological cross-sections nd maintains the excellence of description that characterizes the first volume. The listricts treated are those most frequented by tourists. COLLIER COBB.

MAIN, A. **Le régime des cours d'eau des Alpes françaises.** Diagrs. *Recueil les Trav. de l'Inst. de Géogr. Alpine,* Vol. 3, 1915, No. 3, pp. 243-335. Grenoble.

Swiss touring-atlas (pocket edition), with alphabetical index of places and maps of ix towns. [Road maps in 7th edit. 1:400,000.] Frobenius, Ltd., Basle, [1915?]. 7½ x 4½.

GERMANY

BAUMGARTEN, RICHARD. **Deutsche und Polen in Oberschlesien.** Ills. *Deutsche Erde,* Vol. 13, 1914-15, No. 7, pp. 175-179. Gotha.

BORRIES, EMIL V. **Die geschichtliche Entwicklung der deutschen Westgrenze zwischen den Ardennen und dem Schweizer Jura.** Map. *Petermanns Mitt.,* Vol. 61, 1915, Oct., pp. 373-377; Nov., pp. 417-422.

FRIEDERICHSEN, MAX. **Die Ostseesturmfluten der Jahreswende 1913-14 und hre Wirkung auf Pommerns Küsten.** Diagrs., ills. *14. Jahresbericht der Geogr. Gesell. zu Greifswald, 1913-14,* pp. 357-368. [Accompanied by thirty-two photographs llustrating the erosional effects on the coast of Pomerania of the storms of Dec. 29-30, 1913, and Jan. 9-10, 1914, in the southern Baltic.]

HALBFASS, WILHELM. **Die Ausnutzung des Bodens als Acker- und Gartenland in Preussen im Jahre 1913.** *Petermanns Mitt.,* Vol. 61, 1915, Nov., pp. 437-439.

MARBITZ, HEINZ. **Phänologische Beobachtungen in Pommern.** *14. Jahresbericht der Geogr. Gesell. zu Greifswald, 1913-14,* pp. 369-383.

PRAESENT, HANS. **Beiträge zur Kenntnis des Greifswalder Boddens. I: Vorläufiger Bericht über die hydrographischen Untersuchungen des Geographischen Institutes der Universität im Greifswalder Bodden.** *14. Jahresbericht der Geogr. Gesell. zu Greifswald, 1913-14,* pp. 333-356.

RÜBENACK, WILHELM. **Grosse Geschiebe in Pommern.** *14. Jahresbericht der Geogr. Gesell. zu Greifswald, 1913-14,* pp. 321-331. [Continuation of the papers bearing he same title by W. Deecke, A. Haas, and E. Friedel in the eleventh volume of the nnals of the Greifswald Society.]

RUSSIA

HUBBACK, JOHN. **Russian Realities, Being Impressions Gathered During Some Recent Journeys in Russia.** xv and 271 pp. Map, ills., index. John Lane Co., New York, 1915. $1.50. 5½ x 8.

It is often a far cry from impressions to realities, and in this case the sub-title must e taken as the real key to the book, for Mr. Hubback's journeys, together with his vident ignorance of Russian, could hardly permit him to feel the mainsprings of ussian life. With over eighty-five per cent of the population agriculturalists, one can ardly expect to see the real life of the people in the important trade centers of uthern European Russia, the descriptions of which practically fill the book.

To whet the reader's appetite there is first of all a superficial historical outline. hen the journey begins in true Russian style with a religious touch, an Easter service Odessa. One is in Bessarabia only long enough to see a wall built by Trajan, and, e next instant almost, the big cities of Russian and Austrian Poland are flying past, arsaw, Cracow, and Lemberg. One is lost in a maze of churches in Kiev and then shed off on a sketchy trip along the Black Sea, visiting the harbors from the Dnieper the Don. Then one is charmed with southern Russia in the tender green of spring d the soft gold of the summer grain fields. Before one has half seen Moscow one is rried off to the Caucasus and then back into the mêlée of the battle of Poltava. Going stwards again Rostov-on-Don and Astrakhan lie in our path to the wheat fields of the iddle Volga. A word about the ubiquitous German merchant is of interest. One onders who will replace him after the war and whether it will be an American. One uses to glance at the scenes of the Crimean War, and then the journey is ended with dash for England just as the war cloud was bursting.

As a faithful record of things seen the book contains some useful material. Wer one not whisked about with such disconcerting rapidity one's after impressions woul have less the character of poorly developed snapshots. The outward expression o impressions made on Mr. Hubback by his trips is hardly charming enough to inspir one to undertake a journey to Russia, but the impressions themselves, agreeable a they are, might accomplish this end. And therein would lie the great good of the book

E. K. Reynolds.

Rosen, H. **Die ethnographischen Verhältnisse in den baltischen Provinze und in Litauen.** Map. *Petermanns Mitt.*, Vol. 61, 1915, Sept., pp. 329-333. [Accom panied by a map, 1:2,800,000, showing by *uyezds*—the administrative subdivision nex in rank below the *gouvernement*—the proportional distribution of races (Letts, Esthon ians, Lithuanians, Zhmuds, Poles, Great Russians, White Russians, Finns, Swedes).]

Italy

—— **Dislivelli fra Adige e Brenta nella zona marittima: Studi nell' interess della navigazione interna (Nota preliminare).** 10 pp. Map, diagr. *Uffici Idrografico Pubbl. N. 35.* R. Magistrato alle Acque, Venice, 1911.

Fabiani, Ramiro. **La regione montuosa compresa fra Thiene, Conco e Bassan nel Vicentino.** 83 pp. Maps, diagrs., ills., index, bibliogr. *Ufficio Idrografico Pubbl N. 41 e 42.* R. Magistrato alle Acque, Venice, 1912. [Deals with the geology, physiography, and hydrography of the region. Accompanied by a geological map, 1:75,00 and a map indicating the permeability of the rocks, 1:100,000.]

Guarini, Emilio. **La guerra economica e la sua importanza nell'ora attuale Espansione commerciale verso l' America Latina.** *L'Esplorazione Commerc.*, Vol 30, 1915, No. 8-9, pp. 289-335.

Kende, Oskar. **Italien und die dalmatinische Inselfrage.** Map. *Kartogr. u Schulgeogr. Zeitschr.*, Vol. 4, 1915, No. 9, pp. 145-149. Vienna.

Magrini, Giovanni. **Carte annuale delle pioggie nella regione veneta per i 1911.** 44 pp. Maps, index. *Ufficio Idrografico Pubbl. N. 43.* R. Magistrato alle Acque Venice, 1912. [With rainfall map, 1:500,000; nine density grades shown.]

Magrini, Giovanni. **Carta annuale delle pioggie nella regione veneta per i 1909-1910.** 29 pp. Maps. *Ufficio Idrografico Pubbl. N. 33.* R. Magistrato alle Acqu Venice, 1911. [With rainfall map for each year, 1:500,000; nine density grade shown.]

Magrini, Giovanni. **Gli osservatori meteorologici della rete di 1° ordine del Ufficio Idrografico.** 24 pp. Diagrs., ills. *Ufficio Idrografico Pubbl. N. 64.* R. Magi trato alle Acque, Venice, 1915.

Magrini, Giovanni. **Norme ed instruzioni per il servizio mareografico.** Part **1: Osservazione delle maree.** 46 pp. Diagrs., ills. *Ufficio Idrografico Pubbl. N. 3* R. Magistrato alle Acque, Venice, 1911.

Magrini, Giovanni. **Prima serie di misure di portata sul Mincio.** 9 pp. Ill diagrs. *Ufficio Idrografico Pubbl. N. 52.* R. Magistrato alle Acque, Venice, 1915.

Magrini, G. **Sulla propagazione della marea nella laguna di Caleri.** Diagr 13 pp. *Ufficio Idrogr. Publ. No. 34.* R. Magistrato alle Acque, Venice, 1911. [Suppl ments Publication No. 32 of the same office.]

—— **Rome, Consular District of, Trade of the, Report for the Year 1914 o the.** 19 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5528. London, 1915.

Tredwell, R. C. **Piedmont.** 12 pp. *Suppl. to Commerce Repts.*, Ann. Serie 1915, No. 8d. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washin ton, D. C.

Wilber, D. F. **Italy.** 24 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, N 8c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Carta ippica d'Italia . . . di P. Bartolucci, indicante le varietà di cavalli che possono produrre nelle varie regioni, e che esistono in Italia in base al Censimen Generale 1908. 1:1,250,000. Società Ippica Nazionale, [Rome], [1915?]. [Shows t distribution of the various breeds of horses in Italy according to the census of 1908 a indicates what breeds can best be raised in the various sections of the country.]

Carta topografica dei dintorni di Torino, disegnata da G. E. Fritzsche. 1:100,0 Istituto Geografico De Agostini, Novara, 1915.

AFRICA

SAHARA, INCLUDING EGYPT

CROSSLAND, CYRIL. **Desert and Water Gardens of the Red Sea, Being an Account of the Natives and the Shore Formations of the Coast.** xv and 158 pp. Maps, ills., index. University Press, Cambridge, and G. P. Putnam's Sons, New York, 1913. $3.50. 6½ x 9½.

Mr. Crossland writes of the desolate Egyptian shore of the Red Sea with genuine affection. Yet even he does not pretend that the region is anything but one of the world's most hopeless deserts. In an intimate, friendly way he describes his own observations and experiences while serving as a British official at a lonely post north of Suakin. Living alone among the nomadic landsmen and equally nomadic fishermen, he came to feel that they belonged to him. The ethnologist will gain a few new examples from Mr. Crossland's descriptions of his village, and the geographer will get a vivid impression of the effect of extreme aridity and its resultant poverty upon the habits and character of a people who are among the most backward of British subjects. The real contribution of the book, however, lies in its discussion of corals and coral reefs. Here the author is thoroughly at home and writes with great enthusiasm. Anyone who wishes a clear and non-technical description of coral animals, their life and habits, and the methods by which reefs are formed will find the book helpful. So, too, will those who wish to appreciate the beauty that surrounds the Red Sea coast in spite of man's sordidness.
ELLSWORTH HUNTINGTON.

DOLOT, GÉNÉRAL. **Cinq semaines en Egypte.** Map. *Bull. de la Section Tunisienne, Soc. de Géogr. Comm. de Paris,* 1913-14, No. 4, pp. 27-130.

—— **Port Said, Consular District of, Trade of the, Report for the Year 1914 on the.** 18 pp. Maps. *Diplomatic and Consular Repts.,* Ann. Series, No. 5474. London, 1915.

SUDAN AND UPPER GUINEA

—— **Mission Tilho (1906-1909), Documents Scientifiques de la: Vol. 3.** 485 pp. Map, ills. Ministère des Colonies (issuing bureau); E. Larose (publisher), Paris, 1914. 11 x 7.

The great geographical achievement of the Tilho Mission to Lake Chad was the minute study of that mysterious lake. We are using Captain Tilho's fine map of the lake today, and our present detailed knowledge of Lake Chad and of the country of Kanem to the north of it is derived mainly from the patient researches of Tilho and his scientific staff. The Mission, however, was equipped to carry on studies in other fields than geography, and, with the support of the French Colonial Ministry, three volumes of scientific papers, supplemental to Captain Tilho's general report of the expedition have now been published (for notice of Vol. 1 see *Bull. Amer. Geogr. Soc.,* Vol. 43, 1913, p. 303).

The third volume consists of papers based upon the work and natural history collections of the Tilho Mission, supplemented to some extent by zoölogical collections of other scientific investigators. The first paper (pp. 1-111), a reprint of which was reviewed in the *Bull. Amer. Geogr. Soc.* for July, 1915, p. 541, is a remarkable study by Dr. R. Gaillard, physician of the Tilho Mission, and L. Poutrin, of the Paris museum of natural history, on the anthropology of the Chad and Kanem regions, based upon measurements and other physical studies. The conclusion is reached that, while this work has brought new elements to light in our knowledge of man in the Chad region, it does not elucidate the vexed problems of the original peopling of this part of Africa. It may be, when similar studies are made of the surrounding peoples, that the problem, upon which history throws no light, will be nearer a solution or completely solved.

The other papers are "Crânes de la région du Tchad," by Dr. P. Rivet (pp. 115-118); "Reptiles et batraciens," by Dr. Jacques Pellegrin (121-129); "Les poissons du bassin du Tchad," by Doctor Pellegrin (133-282); "Seconde notice malacologique," by Louis Germain (285-322); "Étude sur les diptères recueillis par la Mission Tilho," by J. M.-R. Surcouf (325-458); "Les collection botaniques rapportées par la Mission Tilho, avec indications sur les plantes utiles," by François Pellegrin (461-484). Photographs and line drawings are numerous.

—— **Guinea española: Reclutamiento de braceres.** *Rev. de Geogr. Colon. y Mercantil,* Vol. 12, 1915, No. 11-12, pp. 417-420. Real Soc. Geogr., Madrid. [In May, 1914, a contract was ratified between Spanish Guinea and Liberia under which the former was enabled to secure native labor from Liberia for Fernando Po.]

Milbourne, A. H. **Palm Kernels from West Africa: Movement to Establish the Industry in Great Britain.** *Journ. African Soc.*, No. 58, Vol. 15, 1916, pp. 133-144.

Yerby, W. J. **French West Africa.** 4 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 69a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Congo Basin and Lower Guinea

Danckelman, A. von. **Eine geplante jüdische Ackerbaukolonie in Angola.** *Petermann's Mitt.*, Vol. 61, 1915, Sept., pp. 357-358.

Iginio, Badolo. **Note sui commerci del Congo Belga.** 9 pp. *Direz. Gen. degli Affari Commerciali* [*Publ.*] *No. 12.* Minist. degli Affari Esteri, Rome, 1915.

McBride, H. A. **Belgian Kongo.** 11 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 64a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Industry in the Belgian Congo is still in the purely extractive stage and hence is peculiarly susceptible to outside influences. The early days of the war suddenly cut off trade with the mother country, upon whom the colony had been practically entirely dependent for import and very largely—over 75 per cent—for export markets.]

South Africa

Laite, W. J., comp. and edit. **Laite's Commercial Blue Book for South Africa, 1915: A Practical and Comprehensive Book of Reference on South African Trade.** 635 pp. Map. South African Publishers, Ltd., Cape Town, 1915. 10s. 8½ x 6.

The fullest compendium published of facts and figures relating to the trade of South Africa. The map (listed below) shows the distribution of agricultural, mineral, and other products and the railroad net of South Africa. The junction is indicated of the railroad system of the Union of South Africa with that of German Southwest Africa (see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 879). Coal is not indicated at Wankie, although this occurrence is one of the large sources of this fuel in South Africa. Twenty pages are given to the official records of meteorology and climate.

Gouldsbury, Cullen. **Notes on the Customary Law of the Awemba and Kindred Tribes. Part I. The Law of Torts; The Law of Crimes. Part II. The Law of Personal Relations and the Law of Contract.** *Journ. African Soc.*, No. 57, Vol. 14, 1915, pp. 366-385; No. 58, Vol. 15, 1916, pp. 157-183. London. [Tanganyika district, Northern Rhodesia.]

Hann, J. von. **Der tägliche Gang der meteorologischen Elemente zu Johannesburg (Transvaal): Temperatur, relative Feuchtigkeit, Verdunstung, Regenmenge, Sonnenschein, Gewitter.** *Meteorol. Zeitschr.*, Vol. 32, 1915, No. 10, pp. 463-467.

Wilson, Thomas. **Black and White in South Africa.** Ills. *Proc. Royal Philos. Soc. of Glasgow*, Vol. 45, 1913-14, pp. 94-115. [In Cape Colony, Natal, Transvaal, and the Orange Free State, there are 1,278,025 whites, of whom 14.5 per cent are in the state- or state-aided schools; there are 4,680,420 colored persons, of whom only 3 per cent are in these schools.]

Map of production (showing routes of railways in South Africa). [1:5,700,000.] Accompanies "Laite's Commercial Blue Book for South Africa," South African Publishers, Ltd., Cape Town, 1915.

Der Victoria-Njansa. 1:1,000,000. Accompanies "Der Victoria-Njansa" von Dr. Joachim Perthes, Justus Perthes, Gotha, 1914. [The monograph which this map accompanies was reviewed in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 889.]

Madagascar and Adjacent Islands

Carter, J. G. **Madagascar.** 13 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 70a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Madagascar continues to make noteworthy progress in many branches of agricultural industry.]

Carter, J. G. **Mauritius.** 4 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 65b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Réunion, Trade of, Report for the Year 1914 on the.** 10 pp. *Diplomatic and Consular Repts.*, Annual Series, No. 5530. London, 1915.

ASIA

General

OLES, L. A. **The Home of Man. Part 4: Asia.** (Series: The New Outlook Geography.) 192 pp. Maps, ills., index. G. G. Harrap & Co., London, 1914. 1s. 3d. 7½ x 5.

This school text is written for the senior forms in the Cambridge (England) examinaions. It contains no new material, but the method of its presentation of geographical naterial is to be commended for clearness and directness. There are many small, clear, lack-and-white maps and diagrams. Pictures are few and help the text. The Indian mpire has the best material. China, Japan, and the East Indies are well treated, though ith rather more detail than is necessary. The first chapter, concerning ocean depths, inds, and currents, applies to the world as a whole rather than Asia. The use of ''antirades'' for ''westerly winds'' is awkward, and the wind diagram on page 14 is incomlete. At the close of each chapter is a heavy load of mere mechanical exercises in raphs, rainfall curves, and statistics. The book is suggestive to American teachers for he methods of presentation and the use of problems, practical suggestions, and exercises.

W. M. GREGORY.

EATON, E. W. **A Regional Geography of the Six Continents. Book 2: Asia.** 86 pp. Maps, ills. Ralph, Holland & Co., London, 1914. 9d. 7½ x 5.

The content and nature of this book may best be indicated in the author's words: 'We are going to look at each continent separately, divide it up into broad 'natural egions' or 'geographical units,' and notice the similarities of each part of the same road region and the contrasts between any one region and its neighboring geographical nits.'' The material is very good but given in an encyclopedic form. It is thoroughly ondensed, making a desirable type of reference book for the teacher of elementary tudents rather than for the pupils themselves, though the text is intended for elementary tudents.

EUGENE VAN CLEEF.

Manchuria, Korea, Japan

SHIZU, R[ISAKU], edit. **The Mineral Springs of Japan, with Tables of Analysis, Radio-activity, Notes on Prominent Spas, and List of Seaside Resorts and Summer Retreats.** Specially edited for the Panama-Pacific International Exposition. viii and 367 pp. Maps, diagrs., ills., index. Tokyo Imperial Hygienic Laboratory, 1915. 8 yen. 12 x 9½.

It is difficult in a short review to do justice to this splendid work, which is so haracteristic of Japanese energy and thoroughness. Some idea of its scope may, however, be gained from the chapter headings, which include: volcanoes and mineral springs f Japan; geology of Japan; general remarks on hot springs of Japan; determinations f radium emanations and electric conductivity; sinter deposits from the mineral prings; the geysers of Atami and Onikobe; radio-active minerals of Japan. All these re included in Part I, while Part II is given over largely to statistical data.

More than 1,500 mineral springs have already been studied and analyzed. Most of hese are located in regions of volcanic activity, but others are found along lines of lislocation away from volcanic zones, and some are even in old plutonic rocks. Many re active in depositing sinter, and in one case a calcium carbonate deposit five centieters thick accumulated in a wooden trough in less than eight years. The radioctive springs, which are located in the northwestern of the four quadrants into which he intersecting longitudinal and transverse tectonic lines of the islands divide them, are ll in granite, and it is pointed out that two of them, Masutomi and Misasa, are among he most radio-active springs known in the world. The radio-active minerals of Japan nclude a new one named *hokutolite*, a mixture of $BaSO_4$ and $PbSO_4$, deposited by a pring in Taiwan (Formosa).

The report also contains numerous data on the springs of other countries, not the east interesting being the comparative tables, in Part II, of mineral springs arranged ccording to radio-activity, temperature, flow of water, and quantity of solid ingredints. These also give the class of waters and kind of rock from which each spring issues.

The work closes with a detailed account of the different Japanese health resorts. Numerous excellent illustrations add greatly to the value of the work. HEINRICH RIES.

BRINKLEY, F., with BARON KIKUCHI, collab. **A History of the Japanese People from the Earliest Times to the End of the Meiji Era.** xi and 784 pp. Maps, ills., index. The Encyclopædia Britannica Co., New York, 1915. 6 x 8.

The object of this highly creditable work by the late Captain Brinkley may be said to be not so much to offer fresh contributions to the knowledge of Japanese history as to make its chief events and personalities accessible to the English-reading public by means of a catholic narration done in a graceful style and following on the main the traditional line of thought current among Japanese of the old type of culture. The work is decidedly stronger on the descriptive side than on the analytical, namely in personal and social relations, in the chronicling of well-known events, and in depicting customs and manners, than in the critical examination of economic, institutional, and cultural forces that have fashioned the evolution of national life and blossomed forth in those phenomena which lend themselves to a descriptive treatment. Herein consist the strong and weak points of this work, so remarkable in wealth of details and literary charm. From this it naturally follows that the work does not aim to develop the theme which would be the chief interest of this journal, that is, the geographical background of Japanese history. For there is little space in a descriptive work like this that may be devoted to an analysis of the remarkably complex geographical and climatic conditions of Japan and their far-reaching effects upon her history in all ages. There are only brief references merely to topographical aspects, and these do not include even the vital relation to national history of so evident a factor as the peculiar position of the Japanese archipelago, exposing it to multifarious climatic influences from the seas and the Asiatic continent. As regards the subtler and more profound effects that may be traced on Japan's career from this and other equally important features of her geography, the reader must be content with no answer at all. The work is entitled to a distinguished place in historical literature in English for its successful chronicling of Japanese annals; as for its value to the student of geographical influence upon history, it must be sought in the abundant historical data it furnishes, which he might seek to interpret by means of a knowledge of Japanese geography gained elsewhere.

K. Asakawa.

— **Hakodate, Consular District of, Trade of the, Report for the Year 1914 on the.** Map. 19 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5478. London, 1915.

Huggins, H. C. **Japan.** 15 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 55e. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Miller, R. S. **Chosen (Korea).** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 55f. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Osaka, Trade of, Report for the Year 1914 on the.** 24 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5510. London, 1915.

—— **Shimonoseki, Consular District of, Trade of the, Report for the Year 1914 on the.** 20 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5516. London, 1915.

Malay Archipelago, including the Philippines

Brown, J. M. **The Dutch East: Sketches and Pictures.** xvi and 222 pp. Ills. Kegan Paul, Trench, Trübner & Co., Ltd., London, and E. P. Dutton, New York, 1914. $3.50. 9 x 6.

There is much that is interesting in these newspaper sketches, yet the work as a whole is superficial. Two themes in particular have engaged the author's interest: one is that the Malay Archipelago was populated from the Pacific; the other that sago is destructive to all spirit of human enterprise. The latter follows a common fallacy of logic; he has found men of primitive type living on sago as a staple, but it does not follow that sago as food produces savage barbarism. The idea that Indonesia received its population from Polynesia was rejected by all ethnologists as soon as it was proposed, and it is unfortunate that renewed currency should now be given to it. The problem of Indonesia and Polynesia is sufficiently intricate as it stands, without this addition. We may not be certain as to the time of the great migration; debate continues as to the track of the folk movement toward the Pacific, but it is clearly established that, at some remote epochs, two great waves of migration left Indonesia and colonized the South Sea (for the older migration we are able to establish the general track of migration, and probably we can identify two tracks around New Guinea). For this reason it is to be regretted that this author writes so confidently of a view of the ethnic problem which is quite unsupported by the facts and which has no authority sufficient to entitle it to consideration. William Churchill.

Christie, E. B. **The Subanuns of Sindangan Bay.** 121 pp. Map, ills. *Philippine Bur. of Science, Division of Ethnology, Publications,* Vol. 6, Part I. Manila, 1909. 10½ x 7½.

Mr. Christie provides brief word lists without discussion; these the reviewer has incorporated, duly credited, in his far more extensive vocabulary of the people and has also utilized them in his discussion of the linguistic problems individual to these shy folk in the mountains of southwestern Mindanao and to the broader theory of their place in philological systems (Finley and Churchill: The Subanu). In the record of the life of the people, Mr. Christie has written at considerably greater length than Colonel Finley. Their points of observation are not quite the same. Mr. Christie has the distinct advantage of being trained in the methods of social anthropology; Colonel Finley, as a military commander under the necessity of establishing order in a troubled community, and later as a civil administrator, regarded the Subanu from a different angle, yet in the course of eleven years of work with and upon these savages he acquired a close insight into their life and a warm sympathy for them. William Churchill.

Christie, E. B. **Notes on Irrigation and Co-operative Irrigation Societies in Ilocos Norte.** Ills. *Philippine Journ. of Science: Sect. D,* Vol. 9, 1914, No. 2, pp. 99-113. [See the abstract on p. 222.]

Deninger, Karl. **Geographische Übersicht von Westseran.** Map, bibliogr. *Petermanns Mitt.,* Vol. 61, 1915, Oct., pp. 385-388.

Geologische schetskaart van het westelijk gedeelte van het eiland Soembawa. 1:500,000. Accompanies, as Pl. 2, "Jaarboek van het Mijnwezen in Nederlandsch Oost-Indië," Vol. 42, 1913. M. Nijhoff, The Hague, 1915.

Geologische overzichtskaart van een deel der Tidoengsche Landen, N. O. Borneo. 1:500,000. Accompanies, as Pl. 2, "Jaarboek van het Mijnwezen in Nederlandsch Oost-Indië," Vol. 42, 1913. M. Nijhoff, The Hague, 1915.

Geologische schetskaart van het eiland Enggano, met gebruikmaking van de Top. schetskaart door J. H. Juda. 1:200,000. Accompanies, as Pl. 8, "Jaarboek van het Mijnwezen in Nederlandsch Oost-Indië," Vol. 42, 1913. M. Nijhoff, The Hague, 1915.

Geologische schetskaart van een gedeelte der afdeelingen Makasser en Boni, Gouvernement Celebes en Onderhoorigheden. 1:150,000. Accompanies, as Pl. 9, "Jaarboek van het Mijnwezen in Nederlandsch Oost-Indië," Vol. 42, 1913. M. Nijhoff, The Hague, 1915.

AUSTRALASIA AND OCEANIA

Australia, New Zealand

Hedley, Charles. **An Ecological Sketch of the Sydney Beaches.** Diagrs., ills. *Journ. and Proc. Royal Soc. of New South Wales,* Vol. 49, 1915, Part 1, pp. 15-77. Sydney.

Hunt, H. A. **Australian Monthly Weather Report and Meteorological Abstract, [for] September, October, November, 1912.** Maps, diagrs. Vol. 3, 1912, No. 9: pp. 419-464; No. 10: pp. 469-514; No. 11: pp. 519-565. Commonwealth Bur. of Meteorol., [Melbourne], 1915.

[Geological map of] Tatonga. 1:31,680. Geological Survey of Victoria, [Melbourne], [1915].

[Geological map of] Keelangie. 1:31,680. Geological Survey of Victoria, [Melbourne], [1915].

[Geological map of] Mudgeegonga. 1:31,680. Geological Survey of Victoria, [Melbourne], 1915.

[Geological map of] Bungil. 1:31,680. Geological Survey of Victoria, [Melbourne], 1915.

Geological sketch map of portion of Eyre's Peninsula. 1:570,240. Accompanies "The Supposed Oil-Bearing Areas of South Australia," *Geol. Surv. of South Australia Bull. No. 4.* Dept. of Mines, Adelaide, 1915.

Map of the Buller coalfield, showing coal-bearing areas and general geology. 1:31,680. Accompanies "The Geology and Mineral Resources of the Buller-Mokihinui Subdivision, Westport Division," by P. G. Morgan and J. A. Bartrum, *New Zealand Geol. Surv. Bull. No. 17.* Dept. of Mines, Wellington, 1915.

(a) Geological map of Mokihinui, Ngakawau, Orikaka, and part of Lyell survey districts. 1:63,360. (b) Geological map of Steeples and Kawatiri survey districts. 1:53,360. (c) Geological map of Waitakere survey district. 1:63,360. (d) Geological map of Ohika survey district. 1:63,360. (e) Map of the Buller-Mokihinui subdivision, showing fault-lines. 1:253,440. Accompany, as Maps Nos. 3, 4, 5, 6, and 9, respectively, "The Geology and Mineral Resources of the Buller-Mokihinui Subdivision, Westport division," by P. G. Morgan and J. A. Bartrum, *New Zealand Geol. Surv. Bull. No. 17.* Dept. of Mines, Wellington, 1915.

OCEANS

—— **Hydrographique, Bulletin, pour l'Année Juillet 1913-Juin 1914.** xiii, 46, 37 and 42 pp. Maps, diagrs. Publié par le Bureau du Conseil Permanent International pour l'Exploration de la Mer. A. F. Høst et Fils, Copenhagen, 1915. 13 x 10½.

Just a year of observations—18,000 in all—and some twenty-four plates to illustrate them.

Part A has four charts of isohalines for the surface waters of the North Atlantic and four for the North Sea, based on some 8,000 observations of surface salinity and temperature in the year July, 1913-June, 1914. In the North Atlantic the isohaline of 37 grams salt to 1,000 grams sea water extends between the parallels 20° and 30° N. The 35-gram line extends from Iceland to a little south of the Banks of Newfoundland. The May chart shows the Gulfs of Finland and Bothnia with salinities only 3 grams at their heads. The warmest Atlantic water noted near the European coast was 61° F. in 51°19′ N. and 12°30′ W.—this in September. The coldest water, 32°, occurred about a degree southeast of there on March 27. There is nothing unusual about either, except to worshippers of the Gulf Stream. In the North Sea 59° to 61° occurred near Holland in July and August, with 54° off the coast of Scotland. In January and February the temperature in the southeast is 45° to 50°. Air temperatures in Holland and Belgium were a little cooler than the adjacent sea *at all seasons,* but the British coast air was warmer in winter than the water.

Part B has numerous salinity and temperature sections across the North Sea and Baltic. The waters were a trifle salter in the depths than at the surface. Temperatures in the North Sea were often the same from top to bottom, even in depths of 100 meters. In the Norwegian Channel the bottom water was a good deal colder.

Part C has a few observations on the gas content of the Baltic waters and more than 5,000 records of tidal currents, giving direction and force at ten light-ship stations about the North Sea. Many of these were taken at depths of 5, 10, 15, 20, 25, and 30 meters, as well as at the surface. Tidal ellipses are drawn for all stations.

MARK JEFFERSON.

MERZ, ALFRED. **Neue Anschauungen über das nordatlantische Stromsystem.** *Zeitschr. Gesell. für Erdkunde zur Berlin,* 1915, No. 2, pp. 111-122.

These pages are an echo of Nansen's "Waters of the Northeastern North Atlantic" (reviewed in the *Bull. Amer. Geogr. Soc.,* Vol. 47, 1915, p. 141). On the ground of an inclination of the isopycnic surfaces—surfaces of equal density—to the east in the Atlantic waters off the coast of Ireland and Spain, Nansen had inferred a current to the north along that whole coast toward Norway, a deep current with salt warm underwaters from the Straits of Gibraltar. Nansen thought the Gulf Stream Drift hardly contributed more to the "Irish Stream" than some water occasionally blown upon its surface. He contradicted the usual belief in a south-setting current off the Spanish coast by assuming his current here to extend from bottom to surface. Ships' observations had been supposed to show that the waters did drift southward, "a southward branch of the Gulf Stream Drift." His only evidence of northward motion at the surface was the northward baying of the isohalines toward the Bay of Biscay and the Irish Sea, especially pronounced in spring. But Merz thinks this may be due not to a surface current but to climatic considerations. In winter ocean currents are deeper because the surface waters are cooled more nearly to the temperature of the water below; there is mingling, and motions penetrate. The shallow summer currents are swift, as the whole momentum is applied to the smaller mass of the warm surface water. Here comes Merz's contribution. The Gulf Stream Drift passes through a region of heavy rain in the North Atlantic. It is often more salt in summer because it *moves faster through the rainfall* and receives less of it per unit. But off the Spanish coast evaporation is great, and here the slow winter waters *become salter as they linger.* So Merz concludes that at the surface the Gulf Stream Drift passes south along the Spanish coast with northward flow beneath.

MARK JEFFERSON.

Brennecke, W. **Ozeanographische Arbeiten S. M. S. "Möwe" in westlichen Indischen Ozean 1913.** Diagr. *Annal. der Hydrogr. und Marit. Meteorol.*, Vol. 43, 1915, No. 8, pp. 337-343.

Hann, J. v. **Dr. J. P. van der Stok: Das Klima des südöstlichen Teiles der Nordsee.** *Meteorol. Zeitschr.*, Vol. 32, 1915, No. 10, pp. 471-475. [Abstract of a monograph by Van der Stok.]

Hensen, V. **Die Auswertung der Bodenorganismen des Meeres.** Map, ills. *Die Naturwissenschaften*, Vol. 3, 1915, No. 45, pp. 601-606. [Experiments undertaken by C. G. J. Petersen, director of the Danish biological station, with a view to increasing the supply of food fishes in coastal waters.]

MATHEMATICAL GEOGRAPHY

Surveying and Geodesy

Hugershoff, R. **Die geodätischen und astronomischen Instrumente des Forschungsreisenden: Systematische Übersicht über erprobte und zweckmässige Konstruktionen.** Bearbeitet von ——. 60 pp. Ills. Gustav Heyde, Dresden, 1913. Mk. 2. 9 x 6½.

This "systematic summary of types of instruments which have been tested and proven suitable" for the explorer includes only those surveying instruments of a portable nature which the traveler or reconnaissance officer might be expected to ask for. In its own field it covers everything from a pace tally to a pantograph. A cut is shown of each instrument, accompanied by a short description, a price list and references to a bibliography of German works on surveying and surveying instruments. All instruments are of the latest types, the theodolites being especially good and moderate-priced. Several special slide-rules and calculating machines adapted for simplifying the reduction of observations are shown. James Gordon Steese.

Poynting, J. H. **The Earth: Its Shape, Size, Weight, and Spin.** 141 pp. Ills., index. University Press, Cambridge, and G. P. Putnam's Sons, New York, 1913. 40 cents. 6½ x 5.

Although the preface says that the aim of the book is "to explain in a general way without mathematical detail, how the shape and size of the earth have been determined," sufficient mathematics are introduced to place the literature beyond the capacity of the average teacher who has not specialized in this field.

The explanation of the movement of air in a cyclone is not entirely consistent, as witness the statements: "It [the air moving from the south pole northward] keeps moving into regions traveling less rapidly to the east than the regions from which it has come" and the correct statement, "as it [air moving from the north pole] moves southwards it will be continually moving into regions with a greater west-to-east motion than its own."

Explanations are materially aided by the presence of a number of diagrams. Several interesting theories are advanced, while those already in existence are rather carefully discussed. Eugene Van Cleef.

PHYSICAL GEOGRAPHY

General

Matthew, W. D. **Climate and Evolution.** *Annals N. Y. Acad. Sci.*, Vol. 24, pp. 171-318. Feb. 18, 1915.

This paper is fundamental and revolutionary. It is of primary importance for the geographer and biologist as well as for the geologist. It crystallizes a growing tendency in which Chamberlin stands out as a prominent leader. That tendency is to reject the old idea of a great number of land bridges, which geologists have been wont to postulate wherever necessary in order to explain puzzling facts in the distribution of living forms. In its place there is substituted the hypothesis that "secular climatic change has been an important factor in the evolution of land vertebrates and the principal known cause of their present distribution." Such changes, coupled with the alternate expansion and restriction of the continents by emergencies or submersals of one or two thousand feet, are held to be sufficient to account for a large portion of the facts as to organic evolution.

Doctor Matthew's line of argument runs briefly thus: Recent studies of isostasy and of the strength of the earth's crust make it less and less probable that there can have been great changes in the relative size of continental land masses and oceanic basins.

The chances are that the present continents have existed in the rough throughout a large part of geological times without any marked projections beyond the limits of the presen continental shelf. This is in harmony with the paleontological record, especially the mammalian portion, from which our chief information as to the lands is derived. The study of almost any great branch of mammals shows that the most highly developed forms are found in the cool temperate continental areas such as North America and especially Eurasia. The old idea was that the original home of a family of animals was where the lowest forms are found. This seems to be a mistake. The low forms represent those that have failed to respond to new conditions of environment. As the climate has fluctuated from the warm, moist conditions of oceanic expansion and small low continents to the severe, cold conditions of expanded continents and great elevation, the feebler, less progressive types of animals have migrated with the climate while the stronger, more progressive types have remained in the old locations and adapted themselves to the new environment. Thus the forms found in great continental centers such as Asia are comparatively high, while the allied forms in less rigorous habitats such as the more equatorial lands represent the primitive types which fled instead of facing the new environment.

In conformity with this hypothesis Doctor Matthew traces the development of a large number of diverse families. He shows that the predominant tendency is toward migration from a center in central Asia. The size of that continent has rendered it particularly subject to great climatic extremes, and these have caused rapid evolution as well as a rapid dispersal into areas of less severity. A summary of Doctor Matthew's conclusions as to man well illustrates his method. "All authorities," he says, "are today agreed in placing the center of dispersal of the human race in Asia." There we find the most ancient human remains. Around its borders grew up the earliest great civilizations, in Chaldea, Asia Minor, and Egypt on the west, India on the south, and China on the east. Perhaps the greatest fact in history is the migrations from this region into China, India, Africa, and Europe. In America the history of migration is from Alaska southward. Today the most primitive races are found in South America, Africa, Australia, southern India and other places which are difficult to reach from Central Asia. The old assumption was that man was of tropical origin and came from th places where now he is most primitive. In opposition to this it appears that the higher races are today obviously "adapted to a cool temperate climate, and to an environment rather of grassy plains than of dense moist forests." Even the tropical negro race reaches its "highest physical development not in the great equatorial forests but in the drier and cooler highlands of East Africa; and when transported to the temperate United States, the West Coast negro yet finds the environment a more favorable one than that to which his ancestors have been endeavoring for thousands of years to accustom themselves. . . . It seems fair to conclude that the center of dispersal of mankind . . . was central Asia north of the great Himalayan ranges and that, when by progressive aridity that region became desert, it was transferred to the regions bordering it to the east, south, and west. We may further assume that the environment in which man primarily evolved was not a moist or tropical one but a temperate and more or less arid one, progressively cold and dry during the course of his evolution."

The last sentence expresses Doctor Matthew's main thought not only as to man but as to most of the mammals. He perhaps carries his conclusions somewhat farther than the facts yet warrant, but that is almost unavoidable when a new step of real importance is taken. He is to be congratulated upon having done a piece of work which is sure to have a wide influence upon future studies of evolution.

ELLSWORTH HUNTINGTON.

PHYTOGEOGRAPHY AND ZOÖGEOGRAPHY

DRUDE, OSCAR. **Die Ökologie der Pflanzen.** (Series: Die Wissenschaft.) x and 308 pp. Ills., index. F. Vieweg & Sohn, Brunswick, 1913. Mk. 10. 8½ x 5½.

Drude's "Ecology of Plants" is an able presentation of the present status of the study of plants in their relation to environmental factors. The descriptive aspects of plant geography have not been touched upon,—in fact there has been no comprehensive treatment of the vegetation of the world since that published by Schimper in 1898, in his "Plant Geography on a Physiological Basis." Drude's volume centers around the vegetative, or physiological, classification of plants, the gross form of plants in relation to physical factors, and the bearing of ecological facts and phenomena on the problems of evolution. These are the freshest phases of ecology, from which much of the future work in the subject will doubtless radiate.

A vegetative classification of plants presents far greater inherent difficulties than does a classification according to phyletic relationship. Drude has presented a very natural grouping of plants according to form, gross structure, character of foliage, seasonal habits, etc. His system is nearly free from morphological bias,—although *ginkgo* is placed among the "needle-leaved coniferous trees" and the "thermophytes" are separated into monocotyledonous and dicotyledonous.

The essential structures of plants bear relationships to external agencies, which have been well presented in such texts as Haberlandt's "Physiological Plant Anatomy" and Goebel's "Organography." Drude is concerned with these relationships as constituting in themselves one of the most important aspects of ecology and as furnishing also the logical basis for his vegetative classification of plants. This section of the book is notable for its breadth of treatment rather than for its acumen and detail in the discussion of the many physiological functions with which it has to deal. The periodicity of vegetative and reproductive phenomena is discussed, especially with respect to the relative importance of inherent and external causes in actuating the periodicities of tropical plants. The further discussion of climatic factors leads the author to the exposition of a classification of climates, which he has adapted from that of De Martonne and made to answer more closely the requirements of the student of vegetation. The factors other than those of the climate which are important in the differentiation of vegetation are treated under the heading of "physiographic ecology," together with a discussion of the various classificatory units used in the description of vegetation. The concluding chapters cover such subjects as the dissimilar vegetative types of plants to be found within the same genera, the dissimilarity of physical conditions which are often necessary to plants of close relationship, the comparative geographical distribution of members of certain families and genera, and the distribution and habitats of certain plants which throw light on the operation of evolutionary processes.

Drude's book will take a place together with Warming's "Ecology of Plants" as one of the most comprehensive texts on this subject. FORREST SHREVE.

LEVISON, J. J. **Studies in Trees.** 253 pp. Ills., index. J. Wiley & Sons, New York, 1914. $1.60. 8 x 5½.

The book is designed to supply tree lovers in their contact with the trees along shady streets, through grassy parks, over wooded valleys, and in mountain wildernesses, with a manual which in small compass will give the essential principles of tree growth and forestry. The first 105 pages give a general sketch, with illustrations, of the principal forest trees. The remainder of the book deals with such topics as tree structure and diseases, the care of trees and their utilization for decorative purposes, and the principles of forestry. JOHN W. HARSHBERGER.

STEUER, ADOLF. **Leitfaden der Planktonkunde.** 382 pp. Ills., index. B. G. Teubner, Berlin, 1911. Mk. 7. 9½ x 7.

This volume contains chapters on the following topics: waters of the globe; methods of plankton investigation; adaptations among plankton; their vertical distribution; their horizontal distribution; their geographical distribution; their seasonal occurrence; their importance in nature's economy; and their importance to man.

The chapter on water gives a good summary of the waters of the globe,—their chemical composition, phosphoresence, temperature, light, transparency, color, etc., with reference to the life present. Descriptions of the apparatus in making these studies is also given.

The chapter on methods of studying plankton goes into all the details of the study of plankton, whether qualitative or quantitative. Many diagrams make clear the structure and operation of the nets and pumps used. A discussion of the sorts of nets, net coefficients, preservation, statistical studies, and counting methods concludes a very interesting chapter.

The colors of plankton are discussed from the standpoint of the relationship of color to temperature. This leads to the effect of climate and seasonal variation. The author concludes that colorless plankton occurs quite generally; blue and violet in the warmer waters; red, brown, and dark violet in the colder deeper waters.

Many of the illustrations are colored and all are very accurate. This volume will be of great service to all interested in problems concerning the smaller forms of life in the waters of the globe. R. W. SHARPE.

ABEL, OTHENIO. **Die Tiere der Vorwelt.** (Series: Aus Natur und Geisteswelt.) 88 pp. Ills. B. G. Teubner, Leipzig, 1914. Mk. 1.25. 7½ x 5.

ANDREWS, E. C. **The Development and Distribution of the Natural Order Leguminosæ.** Bibliogr. *Journ. and Proceed. Royal Soc. of New South Wales for 1914*, Vol. 48, Part 3, pp. 333-407. Sydney, 1915.

HUMAN GEOGRAPHY

ANTHROPOGEOGRAPHY

CLEMENZ, BRUNO. **Die Inseln im Weltkriege.** *Kartogr. u. Schulgeogr. Zeitschr.*, Vol. 4, 1915, No. 8, pp. 123-126. Vienna.

SKATTUM, O. J. **Interessesfaererne og de aapne graenser i kolonimagterne politik.** *Norske Geogr. Selskaps Aarbok*, Vol. 25, 1913-1914, pp. 103-117. [On colonia spheres of interest and "open" boundaries.]

SÖDERLUND, ALFRED. **Förslag till intensitetsbeteckning vid konstruktion a täthetskartor.** Diagrs. *Ymer*, Vol. 35, 1915, No. 3, pp. 267-272. [Representatio of population density by the dot method, using plastic symbols, such as a shaded spher or cube. to heighten the effect.]

ECONOMIC GEOGRAPHY

WATERS, H. J. **The Essentials of Agriculture.** x and 455 pp. Ills., index. Gin & Co., New York, 1915(?). $1.25. 8 x 5½.

A student who completes his study of this book should know much about agricultur in the United States, but he need not have gained a working knowledge of farming o of types of agriculture in our country.

The volume is inclusive in scope, accurate in content, and interesting in its form of presentation. It is well printed and well illustrated. The references to availabl literature are chosen with care. It is one of the best general books on agriculture avail able for secondary schools. The topics treated are so numerous and varied that spac forbids an adequate treatment of many. For instance, the necessity of cleanliness i handling milk is merely suggested, and no mention is made of the dangers that ma arise from unclean milk. Tuberculosis and typhoid fever are noted only under th heading "bacteria" in the chapter on plant diseases.

The types of farming predominating in the several agricultural sections of th United States are not discussed, and thus the book is inadequate for the study of loca agricultural operations. It is a volume, like most of its rivals, that may be memorize without the student's getting a real appreciation of the problems arising in any type o farm practice. The basis has now been laid for volumes for secondary schools dealin with farming as an occupation, and this is a different thing from a study of agricultur in an extensive way. RICHARD ELWOOD DODGE.

—— **Almonds, The Sources of Supply of.** *Bull. Imper. Inst.*, Vol. 13, 1915, No. 3, pp. 460-470. London.

GRADENWITZ, ALFRED. **The German Potassium Salts: A Fertilizing Material Indispensable to the Agriculturists of the World.** Ills. *Scientific American Suppl.*, No. 2084, Vol. 80, 1915, Dec. 11, p. 372.

JONES, C. L. **Supplying the World's Coffee.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 5, pp. 129-135.

LAMB, G. N. **Willows: Their Growth, Use, and Importance.** 52 pp. Ills. *U. S. Dept. of Agric. Bull. No. 316.* Washington, 1915.

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RENOUARD, ALFRED. **Le commerce de la laine pendant la guerre.** Ills. *La Nature*, No. 2202, 1915, Dec. 11, pp. 369-373.

—— **Sisal Hemp: Its Cultivation, Preparation, and Utilisation.** *Bull. Imper. Inst.*, Vol. 13, 1915, No. 3, pp. 430-446. London.

TODD, J. A. **The War and the World's Cotton Crops.** *Bull. Imper. Inst.*, Vol. 13, 1915, No. 3, pp. 385-392. London.

TRAVIS, CHARLES, edit. **Railway Rates and Traffic. Translated from the third (1907) edition of C. Colson's "Transports et Tarifs."** (Series: Studies in Economics and Political Science [of the London School of Economics].) 195 pp. Diagrs., index. G. Bell & Sons, Ltd., London, 1914. $1.00. 7½ x 5.

—— **Wolhandel, De, en de wolprijzen in verband met den oorlog.** *Tijdschr. voor Econ. Geogr.*, Vol. 6, 1915, No. 8, pp. 310-315. The Hague.

HISTORY OF GEOGRAPHY AND EXPLORATION

Dall, W. H. **Spencer Fullerton Baird: A Biography. Including Sections from His Correspondence with Audubon, Agassiz, Dana, and Others.** xvi and 462 pp. Ills., index. J. B. Lippincott Co., Philadelphia, 1915. $3.50. 9½ x 7.

Professor Baird was primarily a naturalist and with the necessities and instincts of a naturalist was obliged to take account of geographical features and their effect on the distribution of animals and plants. It is not surprising therefore to find his name among those of the early writers on geographical distribution in America and to discover geographical information of value in his contributions to the natural history of the Mexican Boundary Survey and in the great volumes on mammals and birds which he contributed to the series of Transcontinental Railway Surveys in 1857 and 1858. His painstaking chapter on localities visited by Government expeditions in the early fifties in what was then the Far West has been a blessing to subsequent workers. But Baird's service to geography is not to be measured by his own publications but rather by those of the score of naturalists, geologists, and explorers whose routes and observations were largely based upon his advice.

Baird was a kindly man, always extending a helpful hand to young men interested in the natural sciences. He was a wise counselor, and so modest, sincere, and honest that he held, perhaps longer than any other scientific man, the confidence and esteem of Congress. Few of the younger naturalists and geographers stop to think of the difficulties and meager resources of those who laid the foundations for the work on which they are engaged. Few today realize the extent and comprehensiveness of Baird's contributions to the zoölogy of North America, and only a few of the younger men are aware of the enormous task he set for himself—the preparation of monographic revisions, based on the study of new material, of the mammals, birds, reptiles, batrachians, and fishes of the North American continent.

It was Baird's lot, when entering the prime of life, to be called to the assistant secretaryship, and later the secretaryship of the Smithsonian Institution, in connection with which, and with his later creations, the National Museum and the U. S. Fish Commission, he became so overburdened with public and administrative duties that little time was left for scientific research. Nevertheless his monumental works on mammals and birds were written at odd moments during this trying period. When Commissioner of Fish and Fisheries he planned, and was the means of carrying out, elaborate investigations not only of the natural history of aquatic animals, but of the waters themselves, including the topography of ocean bottoms and the effects of ocean temperatures on the distribution of aquatic animals.

By great good fortune the materials for Baird's biography were placed in the hands of Dr. William H. Dall, for many years an associate and intimate friend. Many letters are given, often introduced and tied together by enlightening remarks, indicating the wide scope of Baird's interests and activities, and showing his relations with Audubon, Agassiz, Henry, Kennicott, Leidy, George P. Marsh, Admiral Farragut, Elisha Kent Kane, and other prominent men of the time.

In reading the volume one is impressed with the feeling that Baird's life was in the main a rather monotonous and self-denying albeit successful struggle to increase the scope and output of scientific research in America and to dignify the position of science in the councils of the Government; and one closes the book with a sense of gratitude to the author and of admiration for the great man whose inspiring example, whose helpfulness to others, and whose energy and patient perseverance accomplished so much for mankind.

C. Hart Merriam.

—— **Vambéry, Arminius, The Life and Adventures of.** Written by himself. With an appreciation by Max Nordau. xxiv and 316 pp. F. A. Stokes Co., New York, 1914 (?). $1.50. 8 x 5½.

This distinguished Orientalist and traveler, who died in 1913 in the fullness of age and honors, gives in this book the first complete picture in the English language of the manifold adventures of his career. As Vambéry says in his prefatory note, the book contains "a strictly personal narrative of my travels and adventures in Asia and in Europe." The story Vambéry tells is unique because his nature and his talents were exceptional. During six years in Constantinople he acquired some twenty Oriental languages and dialects and then traveled as a dervish through forbidden regions of Central Asia—Khiva, Bokhara, and Samarkand. His disguise was not penetrated; his language, accent, and manner were so perfect that no doubt of his genuineness arose, and he returned to Constantinople with stories of valuable information and the most brilliant record of travel in Central Asia by any European up to that time.

This narrative of his adventures is a fitting supplement to his "Travels in Central

Asia,'' published in 1864, and the eight later works from his pen, because it emphasiz the personality and the pronounced opinions and impressions of the man who did thi great work.

SKATTUM, O. J. **David Livingstone.** Map, ills., bibliogr. *Norske Geogr. Selskap Aarbok,* Vol. 25, 1913-14, pp. 1-24. Christiania.

EDUCATIONAL GEOGRAPHY

WALLIS, B. C. **The Teaching of Geography.** (Series: Cambridge Handbooks fo Teachers.) 221 pp. Maps, diagrs., index. Cambridge University Press, Cambridg and G. P. Putnam's Sons, New York, 1915. 90 cts. 8 x 5½.

This book is devoted to the outlining of an ideal course in geography and to th discussion of methods of making school geography effective. The author would presen geography in the following order: descriptive, transitional, systematic, and argumentative. By descriptive geography is meant the study of selected regions through storie so as to lead to a realization of large generalizations, as for instance the larger plan regions of the world; transitional geography is devoted to a study of the home lan and distant lands in order to investigate geographic principles; systematic geography i a ''topical'' causal study of regions; and argumentative geography is a consideratio of the significance of certain selected types of geographic facts.

The plan of procedure is wholly different from that adopted so widely in Americ where school courses begin with ''home geography.'' The author includes many valuable suggestions for ''practical work,'' which has been so prominent in Englis geography teaching in recent years. The American teacher in normal schools o supervisor of geography teaching will find much that is suggestive and helpful in thi volume. RICHARD ELWOOD DODGE.

ADAMS, J. **A Simple Method of Indicating Geographical Distributio** Diagr. *Science,* No. 1081, Vol. 42, 1915, Sept. 17, pp. 366-368.

BENHAM, C. C. **Types of Laboratory Exercises for High School Geograph** *Journ. of Geogr.,* Vol. 14, 1915-16, No. 4, pp. 110-113.

BORGIANI, GIUSEPPE. **Sull' uso dell' articolo con i nomi propri di città.** *L Geogr.,* Vol. 3, 1915, No. 7-10, pp. 347-350. Novara.

HENDERSON, BERTHA. **The Cultural and the Training Value of Geograph** *Journ. of Geogr.,* Vol. 14, 1915-16, No. 4, pp. 97-101.

HUBBARD, J. W. **Supplementary Material for Teaching Geography in Elementary Schools.** *Journ. of Geogr.,* Vol. 14, 1915-16, No. 5, pp. 136-143.

LYONS, H. G. **The Importance of Geographical Research.** *Geogr. Journ.,* Vo 46, 1915, pp. 254-269; or *Scottish Geogr. Mag.,* Vol. 31, 1915, pp. 505-519; or *Scien* No. 1087, Vol. 42, 1915, Oct. 29, pp. 585-597. [Presidential address to Section E at th Manchester meeting of the British Association, Sept. 1915: abstracted in the *Bull. Am Geogr. Soc.,* Dec., 1915, pp. 964-965.]

PHILIPPSON, ALFRED. **Winke für Geographie Studierende.** *Petermanns Mit.,* Vo 61, 1915, Dec., pp. 479-480. [Hints to the author's prospective students of geography the University of Bonn. Admirable, concise statement of the subject-matter and ai of geography.]

REED, W. G. **A Simple Method of Indicating Geographical Distributio** *Science,* No. 1092, Vol. 42, 1915, Dec. 3, p. 798. [Supplementary to the article by Adams, listed above.]

WAGNER, HERMANN. **Die Zukunft des geographischen Unterrichts: Rückblick und Ausblicke.** *Petermanns Mitt.,* Vol. 61, 1915, Dec., pp. 453-462. [An authoritati summary, by the dean of German geographers, of the status of geographical teachin in Germany, its development in the past, and its prospects in the future. In spite o different conditions, the essential facts are also of interest to us in our development.]

THE
GEOGRAPHICAL REVIEW

VOL. I APRIL, 1916 NO. 4

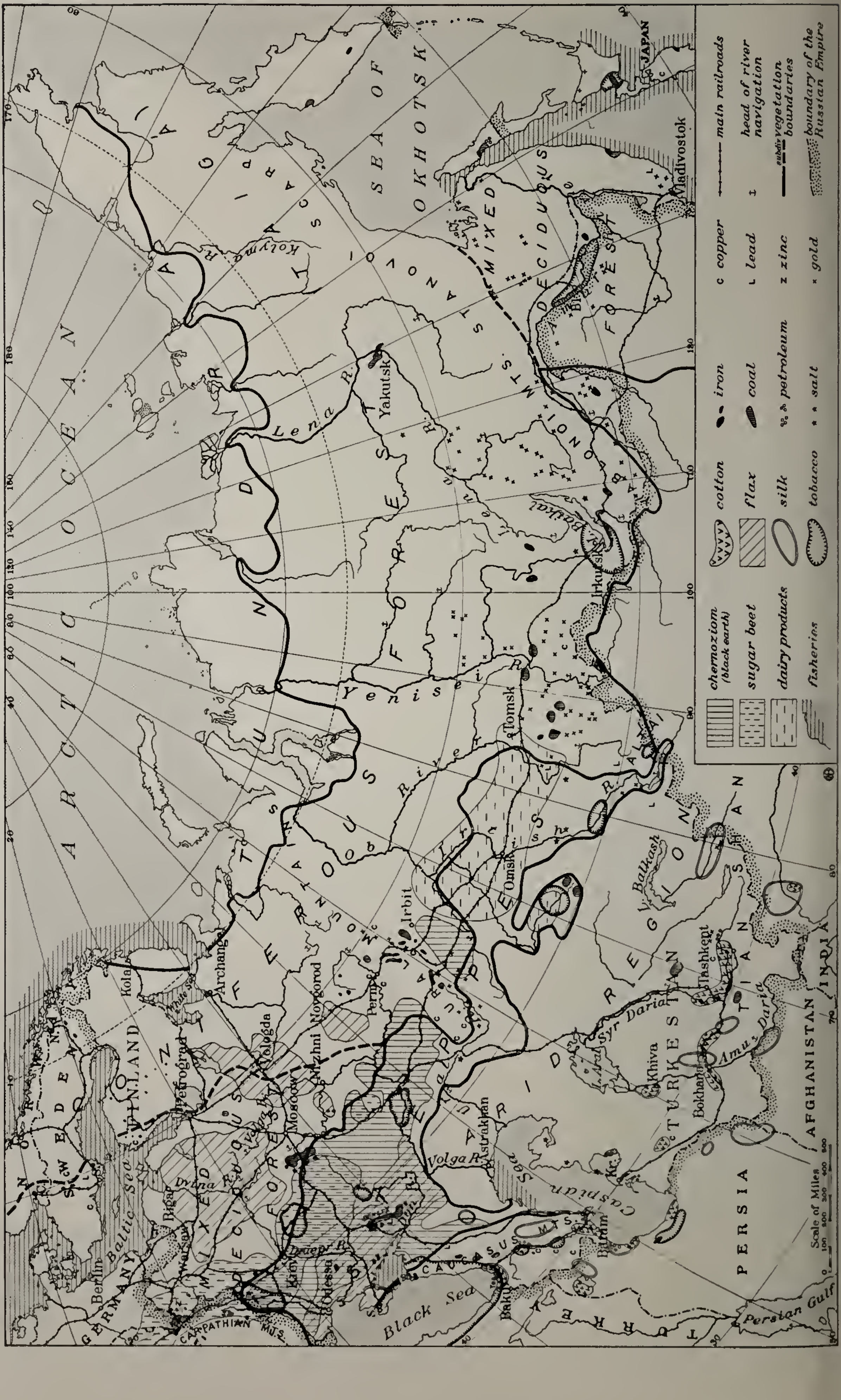
THE ECONOMIC RESOURCES OF THE RUSSIAN EMPIRE

By E. K. REYNOLDS

One of the far-reaching results of the war in this country has been the stimulation of an interest in Russia. This is not exactly a new thing. Americans have for a long time been interested in the great writers, composers, and artists, as well as the politics of Russia. There was a time even, not long since, when Americans were more occupied with conditions in Russian prisons than in their own. But all that has little in common with this new interest, which is pointed toward the discovery of a new Russia, hitherto unsought and unknown,—economic Russia. Politics and fiction are brushed aside, and Russia is being evaluated in terms of her economic possibilities. Americans are beginning to study the growth of the Russian Empire and its wealth in natural resources.

The story of the expansion of a country which has resulted in the largest compact political organization the world has ever seen is necessarily an interesting one. The beginnings of Russian history, like that of every country, are but vaguely known. The foundation stone of the Russian state was laid in Novgorod in 862 A. D., but it was a century or two earlier that a group of Eastern Slavs came down from the Carpathians and settled on the banks of the Dniepr. There they built up a flourishing trading state, with its center at Kiev. The Dniepr became the great trade route; amber from the Baltic and furs, honey, and wax from the forests along its banks were carried down to Constantinople, while gold, silver, stuffs, wine, and fruits were brought up the river in return.

In those days of prosperity, the Eastern Slavs, later known as Russians, were free to develop their local institutions, and, according to all accounts, they governed themselves in an extremely democratic way. They had their princes, but these constituted little more than military leaders and were bound in every way by the will of their subjects as expressed through their common council. Then came the fateful day when the Russians had to sacrifice everything to stem the rising tide of Tatar invasion. They were defeated, but their dead bodies formed a rampart which checked the yellow


ARCTIC OCEAN
TUNDRA
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SEA OF OKHOTSK
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YABLONOI MTS.
ALTAI
URAL MOUNTAINS
CAUCASUS MTS.
CARPATHIAN MTS.
FOREST
MIXED DECIDUOUS FOREST
STEPPE
ARID REGION
TIAN SHAN
TURKESTAN
PERSIA
AFGHANISTAN
INDIA
TURKEY
GERMANY
SWEDEN
FINLAND
NORWAY
JAPAN
Black Sea
Caspian Sea
Baltic Sea
White Sea
Persian Gulf
L. Aral
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Baikal
Kolyma R.
Lena R.
Yenisei R.
Ob River
Irtysh
Volga R.
Dvina R.
Dniepr R.
Don R.
Syr Daria
Amu Daria
Amur
Kola
Archangel
Petrograd
Vologda
Moscow
Nizhni Novgorod
Perm
Arbit
Omsk
Tomsk
Irkutsk
Yakutsk
Vladivostok
Riga
Warsaw
Berlin
Kiev
Odessa
Astrakhan
Baku
Batum
Khiva
Bokhara
Tashkent
chernoziom (black earth)
sugar beet
dairy products
fisheries
cotton
flax
silk
tobacco
iron
coal
petroleum
salt
c copper
lead
z zinc
× gold
main railroads
head of river navigation
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subdiv
boundary of the Russian Empire
Scale of Miles
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30

osts and saved Europe and Western civilization from their onslaught. The
rice that Russia had to pay for this and the real significance of her act
re far from being fully appreciated by her western neighbors. Those same
ations who have to thank her for almost their very existence can find
othing better to do, now that she is emerging from her bitter, century-
ng struggle to take her place in the front rank of the peoples of the world,
han to make faces at her backwardness.

For Russia, the Tatar invasion had the most terrible consequences. It
eant the wiping out of the whole political organization which she had
eveloped along such democratic lines. To escape the oppressive rule of
e invaders, many returned to the Carpathians, to Galicia, but the major-
y moved to the northeast, from Kiev in the general direction of Moscow
nd the upper reaches of the Volga. Here they found themselves suddenly
onfronted with the grim task, first of conquering new homes from hos-
le Finnish tribes, then of wringing an existence from nature in the dark,
ndless forests and marshes of the North, fighting starvation and absorp-
on year after year. These were the conditions under which the "Great
ussians" came into being. Racially the same as the "Little Russians"
f the lower Dniepr, their character underwent a change which has per-
sted to this day. The care-free, unrestrained gaiety of the early days,
hen they were a happy-go-lucky, prosperous nation of traders, was ham-
ered out of them by the circumstances of their daily life, and the Great
ussian peasant was born sturdy, resolute; watchful and mindful of every
ove of nature, he was ready for and resigned to any hardships.

In this new order of things, Moscow became the center of gravity in
lace of Kiev. Its geographical position justified this, because, being situ-
ted on a tributary of the Volga, which flows all through eastern Russia
own to the Caspian, and at the same time being near the headwaters of
e Dniepr, the trade route from the Baltic to the Black Sea, it naturally
ecame the economic center of Russia. Moreover, with the fall of Kiev
e religious center was shifted to Moscow. Finally, and this is the most
nportant reason, it was the prince of Moscow who had the perspicacity to
sinuate himself into the good graces of the Tatar ruler and to learn from
im the art of powerful, centralized government. He was made tax-col-
ctor for the khan, and in this way practically all the Russians were
rought under his control. Then at a given moment he used the power
ested in him by the Tatars to turn against his master and refused him
rther allegiance. This was the beginning of a long and bloody struggle.
hile in western Europe the arts and sciences were free to flourish and
ations could progress, Russia had to keep her lonely vigil at the eastern
te.

Fighting step by step, the Russians followed the great plain to its limits,
andering up to the White Sea, eastward across the Volga to the Urals,
d across the Urals into the level land of western Siberia. They spread

Э. БОНАКЕР
ОБУВЬ

n every direction, continually advancing their frontiers toward the sea, he sea which would be a barrier to their enemies and an outlet for their trade. They succeeded in establishing themselves definitely on the northern shore of the Black Sea, only to find themselves blocked at the Dardanelles. In the east they broke their way through the mountains of eastern Siberia to plant their flag on the shores of the Pacific. But the Pacific was three months' travel from Moscow. The Baltic then seemed to offer the solution to the problem, and Sweden was forced to cede the territory on which Petrograd now stands. This, in brief, is the story of the expansion of the Russian land from a settlement on the Dnieper, northward, southward, eastward, to the Arctic Ocean, the Black Sea, the Caspian, the confines of China, and the shores of the Pacific.

At present the Russian Empire encompasses 42 degrees of latitude and no less than 173 degrees of longitude, that is to say, it doubles the extent of the United States in length and nearly triples it in breadth. The Empire State of New York could be easily set down in the 8,647,657 square miles of the Russian Empire's area 165 times; while Russia, west of the Urals alone, is 10 times the size of France, and 33 times the size of England and Wales. European Russia takes up over one-half of Europe, and Asiatic Russia over one-third of all Asia. So we find Russia occupying more than one-seventh of the total land surface of the globe.

In discussing the various parts of this gigantic whole, custom has fixed a dividing line between east and west in the Ural Mountains. This boundary, however, is, like the equatorial line, more fictitious than real. European Russia and western Siberia are, generally speaking, one vast plain, which slopes on the north to the Arctic Ocean and on the south to the Black Sea and the Caspian. This great plain is barely broken by the Urals: in their central part, where the Trans-Siberian railroad crosses them, the ascent is so gradual that one is not in the least aware of ascending, until at a given moment a sign post is reached which points in one direction, "to Europe," in the other "to Asia." A slight change in the character of the vegetation is also noticed. But before and behind are the great sweeps of level country.

To the Asiatic side of the Urals the farmers from the other end of the plain have been flocking for years, in spite of the ill repute that accompanies a penal settlement. They find natural conditions very little different from the European side, but they find a virgin soil, a chance to start life afresh. They are usually prosperous and happy and less restricted by government regulations. These are the builders of the new Russia. In them there is all the living promise of the future. They have the backbone of the race; they are of the purest Russian stock; and, at the same time, as pioneers in a new country, their vision is broader, they are untrammeled by convention, they are as fresh and vigorous as the untamed nature around them.

Both here and in European Russia, life is more or less the same. That,

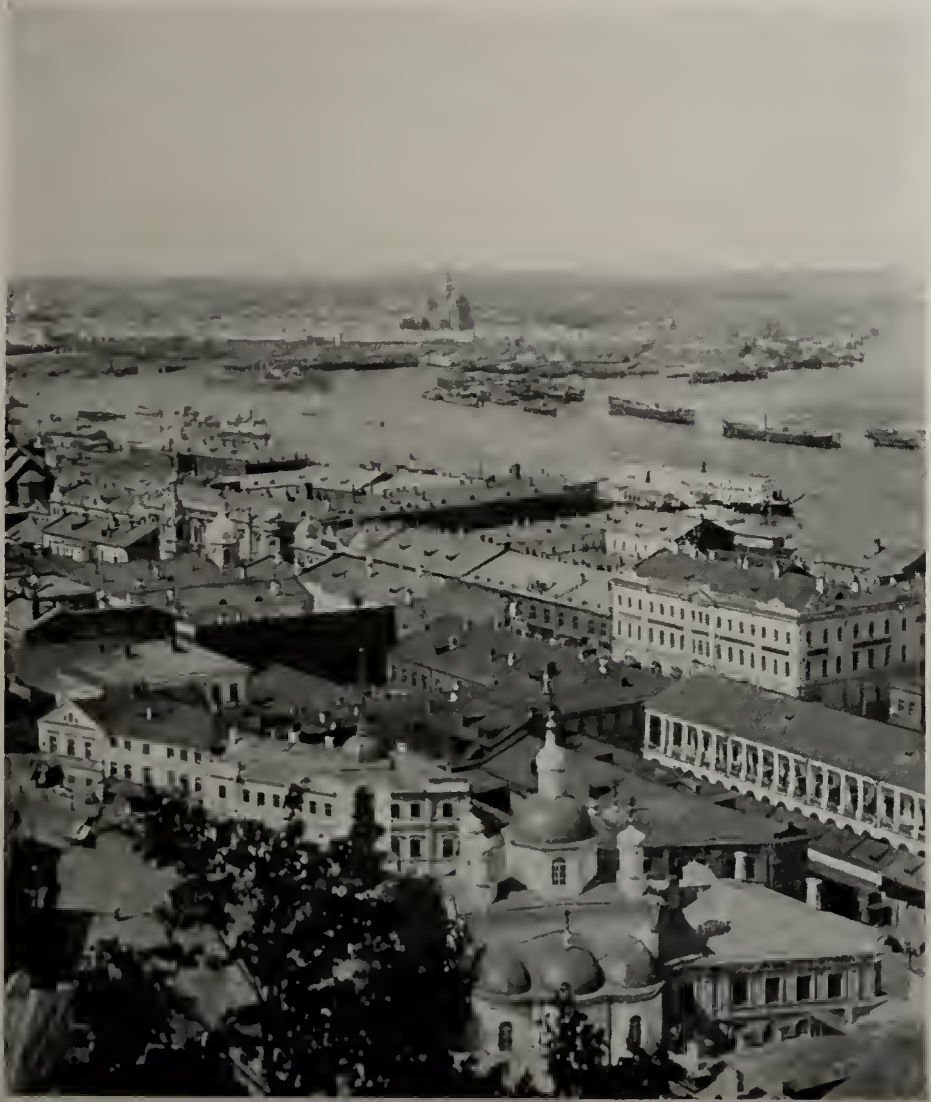

Fig. 3—View of Nizhni-Novgorod and the Fair across the Oka River.

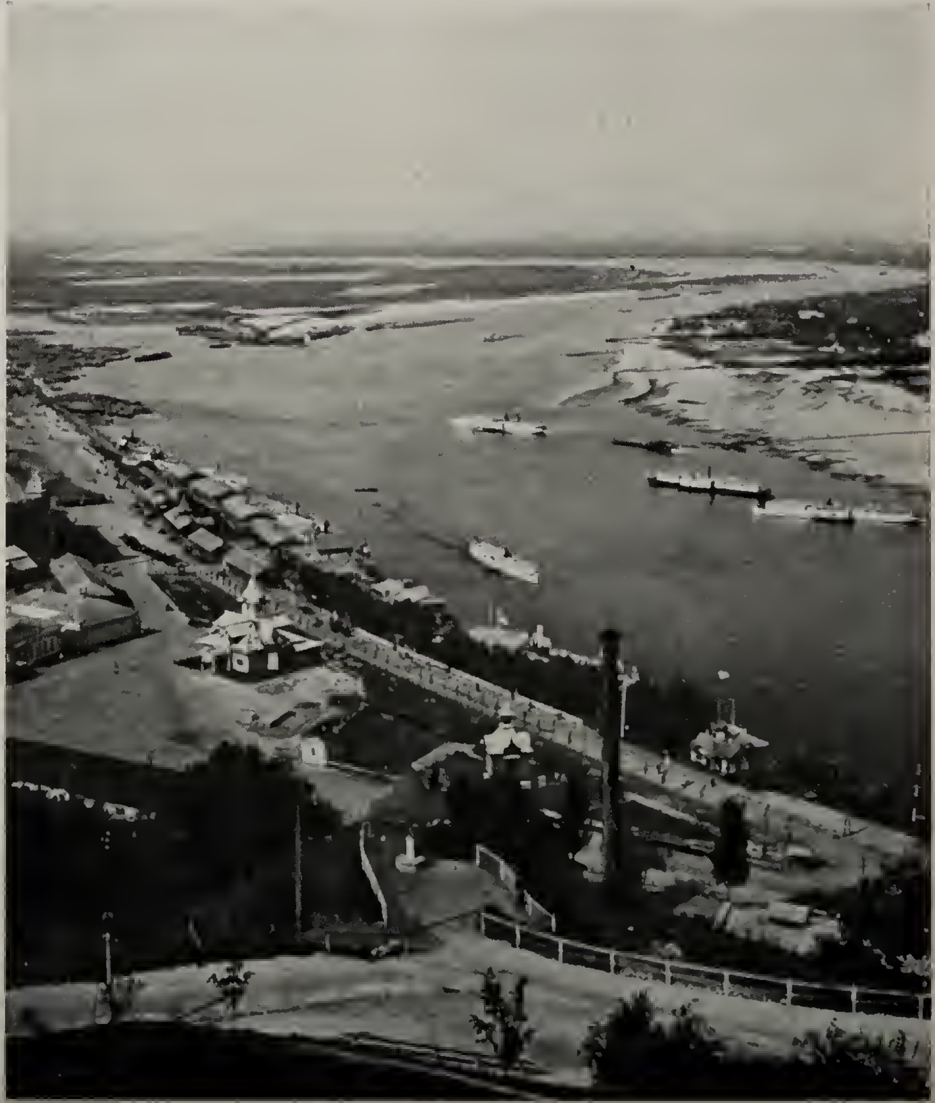

Fig. 4—The plain of the Dniepr at Kiev.

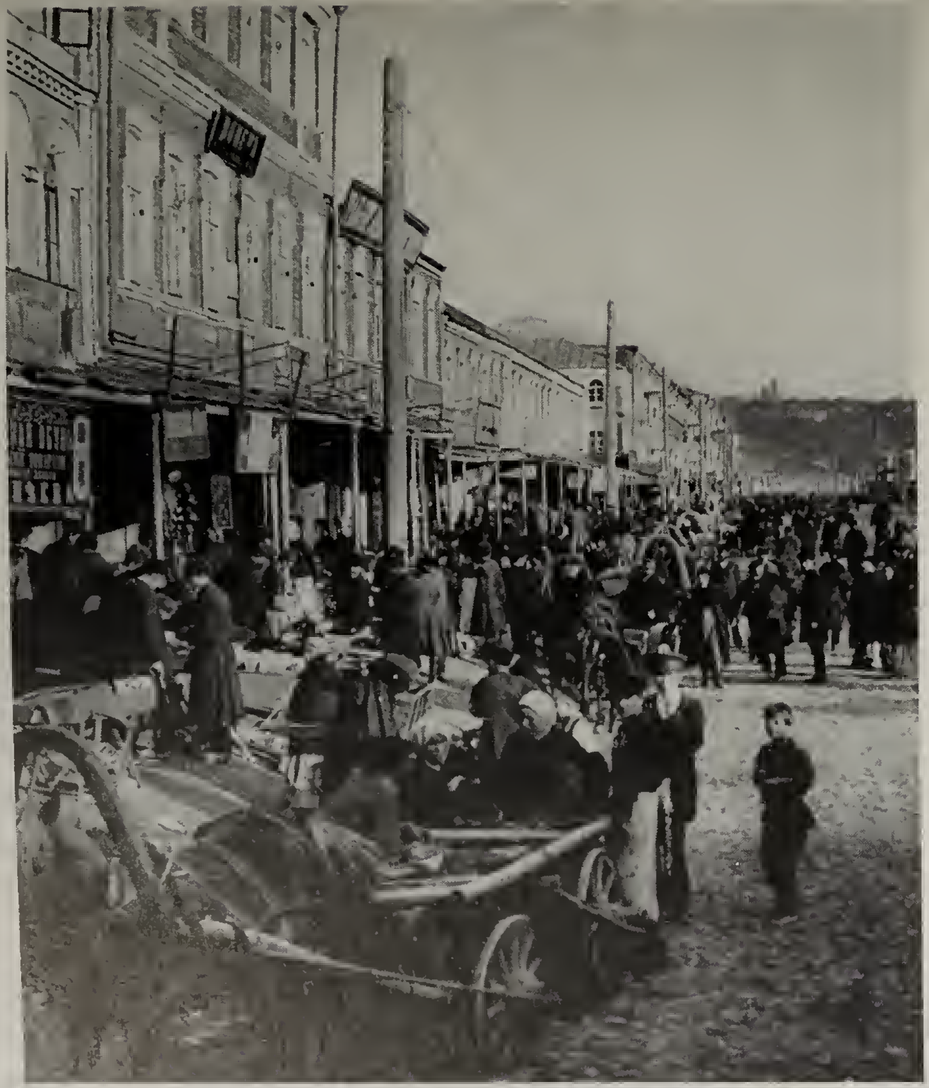

FIG. 5—One of the busy streets in the Fair, Nizhni-Novgorod.
(Photo copyright by Underwood & Underwood.)

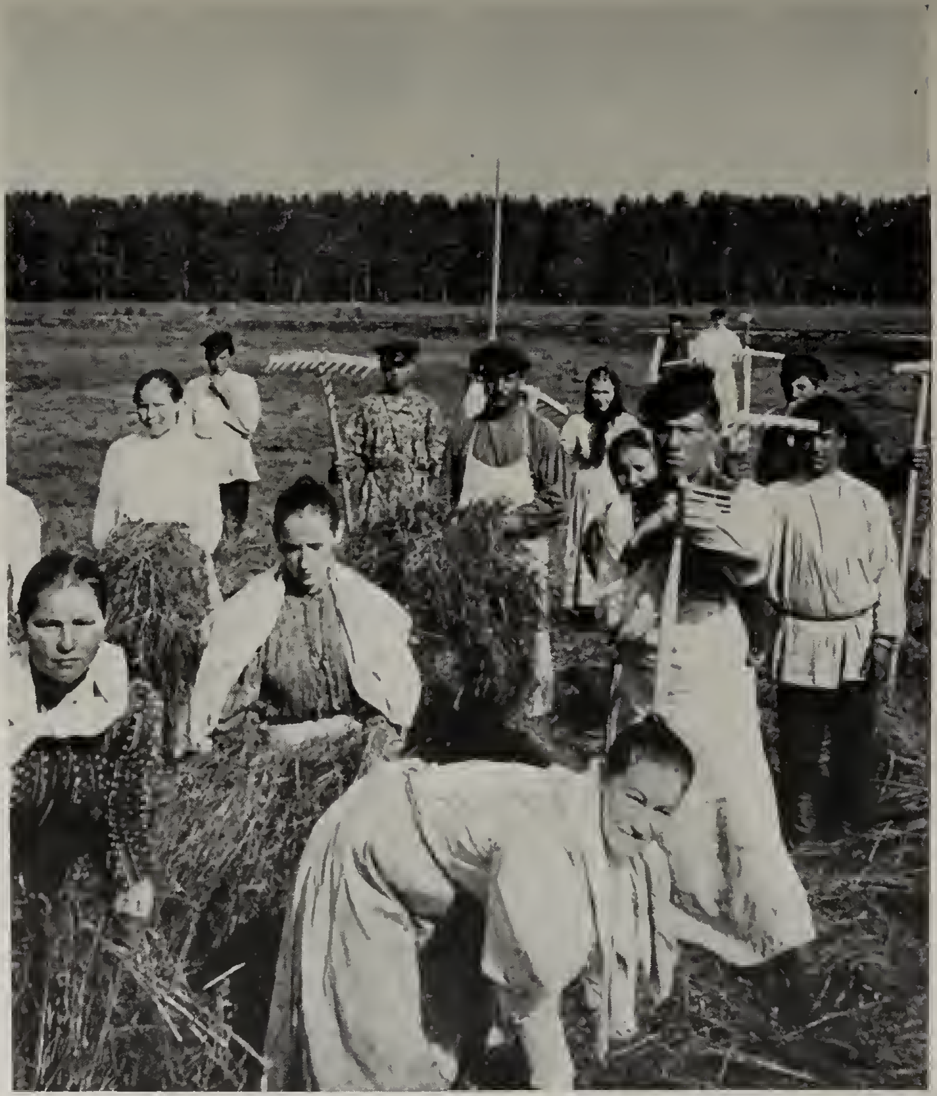

FIG. 6—Russian peasants making hay.
(Photo copyright by Underwood & Underwood.)

too, is the result of the plain—allowing of no differences, the creator of endless monotony. You travel for days and days, north and south, east and west, without finding any appreciable variety in the landscape, unless it be a change from the log cabin of the forest region of the north and center to the white, plastered, thatched cottage of the southwest. This, of course, is a very general statement. There are distinct zones of vegetation, which vary, according to the climatic conditions, from the Arctic Circle to the Caucasus and Central Asia.

First of all in the extreme north, from the White Sea to Bering Strait, there lies the region of the tundras—waste frozen marshes stretching inland from the sea for from three hundred to a thousand miles. It is often difficult to determine the point separating the land from the sea, for the surface of the ground is frozen some forty feet deep; even the heat of summer can thaw only about two feet of top soil. The only possible vegetation consists of moss and a few berry bushes—scant food for the millions of birds and beasts of all kinds that flock northward in July and August to escape their enemy, the hunter. By the end of August, however, the heavy frosts set in, and the tundras become a barren, lifeless desert, covered with snow for hundreds of miles, with never a living speck of any kind on which to rest one's eyes.

To the south of the tundras is the great coniferous forest belt, which stretches from Finland to the Sea of Okhotsk. At its western end, where it is more settled, this is perhaps the most beautiful part of the great Russian plain. The countryside is dark with the shadows of the fir trees, but frequently shot with the light, lithe trunks of silver birches. The aspect of the land, too, is slightly rolling in parts, and cradled between these slight elevations there are thousands of charming little lakes fringed around with reeds.

In Siberia, the forest region is called the *taigá,* which means a vast, more or less unknown surface, covered with dense, impassable forests. Heavy underbrush, fallen trunks, and endless quantities of game are its chief characteristics. Comparatively little of the *taigá* has been reclaimed, that is, turned into farming land. One reason is that the climate here is so extreme and the winters so endlessly long. The cold is so intense that an occasional tree splits open, making a noise like the report of a pistol. It is so cold that the warmth from the body of a bird, as it rises from the ground, will leave a streak of steam. Added to this is the annoyance from the swarms of insects characteristic of Arctic summers. The pioneer settlers had to live in houses filled with smoke to get any relief from them, and they had to build huge bonfires in the pasture lands to protect the cattle.

Yet this *taigá* is one of the greatest treasures in Russia's long list of natural resources. In round figures it is said to represent ninety million acres of magnificent timber. That is less than one-tenth of all the timber resources of the Empire, which are estimated at one and a quarter billion acres. In addition to the great northern forest belt, there are extensive forests on the Urals and the Caucasus. The trees of the *taigá* are pines, firs, spruces, larches, and allied species, intermingled here and there with various kinds of birches, aspen, and a few other leafy trees. At its western end, in the central provinces of Russia, the *taigá* abuts upon the mixed deciduous forest which covers all of cool-temperate Europe. Oak, maple, elm, ash, and poplar are the chief trees. The Mediterranean vegetation of southern Crimea and the eastern Black Sea littoral contains such species as the cork-oak and the yew.

Even to guess at the actual value of these forests would be futile, for they are barely touched as yet. Nevertheless, Russia has exported yearly of late $81,800,000 worth of timber of various kinds, principally to England, Belgium, Germany, and Austria,—this in spite of the enormous home consumption. All northern and central Russia is built of wood, stone being scarce and inaccessible. It is said that all Russia burns down every seven years! The Russians use wood almost exclusively as fuel, both on the railroads and for heating. It is interesting that in renting an apartment one pays a round sum which includes so many cords of wood for heating purposes. The Russians also employ wood very extensively for utensils and implements of various kinds. Fortunately, there are forest preservation laws. These do not enforce the replacing of trees, as is the case, for instance, in Germany, but a forest cannot be cut more than once in a period of eighty years. In any case, Russia has an abundant supply of timber for the present and a good bit of the future in her great forest regions, enough for herself and her friends.

These same regions are a source of great wealth for a second reason. They are teeming with game of all kinds. Hunting, therefore, is naturally the means of support for many, whether Great Russian peasants in the west, Siberian hunters and trappers in the east, or wild tribesmen in the forests of the Urals or out-of-the-way places of the Empire. Here, again, it is impossible to ascertain the extent of the hunting done, except from the skins and birds that are brought to market. There are regular centers for trading in skins. Yakutsk in eastern Siberia is one of the largest markets, and there is a fair held in Irbit, in the Urals, every year, which is given up entirely to barter in skins. Here the traders buy up the sables and ermines for which the Ostiaks have hunted along the Ob, or the Tatars and Soiols in the Altai ranges, or the Yakuts in the region of the Yablonoi or Stanovoi Mountains. The variety in the game is astounding. The skins range from $10.00 for Arctic fox to $50.00 for dark sable. With this abundance of supply, it surprises at first that furs ready for wearing apparel should be so expensive in Russia. The reason for this is that no furs are dyed in Russia. The skins are sent mostly to Leipzig, prepared and dyed, and then shipped back to Russia, laden with duties.

On the outskirts of the forest zone, in the provinces of Vologda and

Yaroslavl (east and southeast of Petrograd) and in the Baltic province lies the great flax-growing country—4,050,000 acres given up solely to th industry. Flax has been grown here for centuries and has given to Ru sian linen its high reputation. The flax for the finer uses comes from th Baltic provinces and that for the coarser products principally from Vo ogda, the home of the strikingly beautiful Russian laces, drawn-work, an embroideries which have brought to the outside world a realization of th unusual artistic ability of the Russian peasant.

To the south of the forest zone in European Russia and western Siberi lies the open country, usually known as the steppe region. At the very men tion of the name "steppe" many assiduous readers of pseudo-Russia fiction will smile knowingly and conjure up visions of a Russian Wild Wes —overrun with ferocious Cossacks, and probably a sprinkling of Kalmyk As a matter of fact, however, the wild riders of the plain have been super seded by the farmers. The plow has robbed the horses and sheep, even i the southernmost parts, of their fertile pastures. In traveling southwar now one sees nothing but farm lands, fields of grain everywhere, until th very edge of the Black Sea is reached. The steppe is principally th granary of Russia. Hundreds and thousands of tons of wheat, rye, oat and barley are harvested every year. In the crop of 1914 there was nearl 400,000,000 hundredweight of spring and winter wheat alone. Some of th best grain-raising tracts are found in the "black earth" region, the *cher noziom*. This is a band of unusually fertile land, stretching from the neigh borhood of Kiev in southwestern Russia in a general northeasterly directio to Tambov and the middle stretches of the Volga and somewhat beyond. I covers an area of 270,000,000 acres and, if farmed to its fullest extent, coul more than feed the whole population of Europe.

To the south and east, though the climate is much drier, the grain is ver good and plentiful. It was from these driest parts of the grain-producin country that Russia sent help to our state of Kansas when the continue droughts there had ruined the entire crop. The state was in a very sa predicament for a time. The situation was saved, however, by introducin the Russian grain, which had adapted itself to drought, and could there fore flourish in Kansas.

The best wheat comes from Siberia. The frozen ground thaws wit the rays of the summer sun and gives to the grain a steady but just sufficien supply of moisture to produce a full, but firm wheat. Western Siberia i given up more to hay fields than to wheat fields. This is the center of th dairy industries. In 1913, 123,000,000 pounds of butter were exported— enough not only to feed Russia, but also to send to England and, in smal amounts, to the United States.

To the south of the steppes of western Siberia lie Russia's Central-Asia possessions, the fourth largest cotton-producing area of the world. Sinc ancient times this territory has been irrigated and cotton has been raise here, though not in very great quantities. Russia used to obtain most of her cotton from China. Now the tables are somewhat turned, and many of the blue cotton coats worn by John Chinaman come from Russia. There has been a great increase in cotton growing in Central Asia and in eastern Transcaucasia; during the last decade the sowings have multiplied by three hundred and fifty times. Although over 1,300,000 acres, with a yield of over 9,250,000 hundredweight, are planted, the domestic supply is not equal to the demand, and nearly half of Russia's supply of raw cotton has still to come from abroad, from America or the British possessions.

FIG. 7—The heart of Moscow, with the buildings of the Kremlin in the background.

Central Asia, particularly Turkestan, is also the original home of Russian silk. From time immemorial the raising of Bagdad cocoons and the weaving of silk have been a staple means of support for the population.

From Persia Russia took a section of her silk-producing country when the Caucasus was conquered, and with it the province of Erivan, whose silks were famed even in the old epic tales of Russia. A great many cocoons, of the Italian variety, are raised in southern Russia. The industry, however, is quite sporadic, and it is difficult to know exactly how much is produced there. The total yield of cocoons in all three of these areas amounts to nearly 160,000 hundredweight a year. The fact that here, as usual, the domestic supply cannot meet the demand agrees strangely with the fact that Russia in 1913 exported $2,300,000 worth of cocoons, in raw silk and silk fabrics. The reason is that Russia has not yet built enough silk-winding factories. She is still dependent on foreign countries, France particularly, for fine silk fabrics and for wound silk (which is often made from Russian cocoons!)

Since the construction of the Transcaspian railroad, which opened up markets in European Russia, and consequently abroad, for the products of Russia's Central-Asian possessions, these regions have proved themselves a source of great wealth, not only because of their cotton and silk, but also because of the magnificent fruit which is being raised there in increasing quantities—luscious and fragrant apples, which turn translucent in the sun, apricots, pomegranates, figs, etc. The gardens of Central Asia are able to grow an extraordinary variety of products. Fruit culture is also increasing in the Caucasus and southern Russia; extensive orange plantations have been set out, and their fruit has become extremely popular now that the war has cut off the usual supply of oranges from Italy. Land is being reclaimed and set out in fruit farms around Astrakhan. The Crimea, with its extremely mild climate, has, of course, always been a great fruit-growing center; and Bessarabia, near the Rumanian frontier, is particularly noted for its apples and vineyards. The Russians are very fond of fruit, particularly dried, or in the form of fruit pastes or preserves, often using jam in their tea instead of sugar.

The real Russian tea, not that generally known to us and which comes to Russia from China, is being grown now in fairly large quantities. In 1913, 2,130 acres in the Caucasus, on the Black Sea coast, produced nearly 1,200,000 pounds. Russia is the only tea-growing country in Europe. The plantations, started by Chinese workers, are growing quickly and giving very satisfactory results.

Tobacco is raised either from native, American, or Turkish seeds. In 1912 there were over 175,000 acres under tobacco, in southern Russia, Siberia, and Central Asia, with an annual yield of over 2,350 hundredweight; seventy per cent of this is grown from native seeds. This tobacco is called *makhorka;* the ordinary peasant smokes it, and it is recognized from afar because of its extremely pungent odor. American and Turkish tobacco is also raised in southern Russia and in the Caucasus.

These are but a few items in Russia's vast storehouse. She has nearly

2,000,000 acres in sugar beets, Little Russia, the southwestern region of the country, giving the highest yield and the best beet.

But she possesses one especial jewel which places her in the front rank of the wealthy nations of the world, her mineral resources—iron, oil, copper, gold, and precious stones. In the province of Ekaterinoslav, north of the Crimea and the Sea of Azov, lies the great Donetz coal basin, the largest coal field in Europe, containing about a billion tons of flame and coking coal and two and a half billion tons of anthracite. These are the best exploited of the coal mines of the Empire, because of the facilities for transportation and because of their close proximity to enormous beds of iron ore. This region, from being pastoral and agricultural, has become the ''black country'' of Russia. Busy industrial settlements have sprung up, and, as at Pittsburgh, the sky at night is lurid from the flames of many gigantic blast furnaces.

Then there are the great Dombrova coal fields of Poland, said to contain 855,000,000 tons; and millions of tons of inferior coal in the Moscow region. The rest of the coal deposits are still almost inaccessible. The Caucasus, for instance, is very rich in coal and is said to contain billions of tons, while the coal fields in Asiatic Russia, particularly in the province of Irkutsk, are even richer. One hundred and fifty billion tons are claimed for that one region alone. The supply in the Urals is destined to play an important part in the industrial life of the country, as soon as railroads and labor make these mines sufficiently accessible. One must always add labor to the obstacles in the way of developing the mines, because, being primarily agriculturists, the miners prefer to leave their work and go back to their farms during the harvest time, so that, while the grain is ripening and being gathered in, the amount of labor available for the mines is reduced to a low figure. Nevertheless, in time, the seventy-five billion tons of coal in European Russia and the one hundred and seventy-five billion tons of Asiatic Russia are bound to come into exploitation in the natural course of events.

This is also true of the iron resources of Russia. There are big iron centers in southern and central Russia, Poland, and the Urals. The largest deposits, and those with the purest ore, lie along the southern border of the province of Ekaterinoslav contiguous to the Donetz coal fields. This region supplies seventy per cent of the output of pig iron for European Russia, and although all the Russian ore is very easy to reduce, this ore is particularly so, and its fortunate position in regard to the coal beds nearby will probably soon make of the region one of the most important sections of Russia, and an iron famine, such as was experienced in 1913, will be made impossible. Somewhat the same happy juxtaposition of coal and iron and facilities for transportation obtain in the Altai, in western Siberia, and the temporary dearth of this valuable material will soon be overcome, and Russia will have enough and to spare.

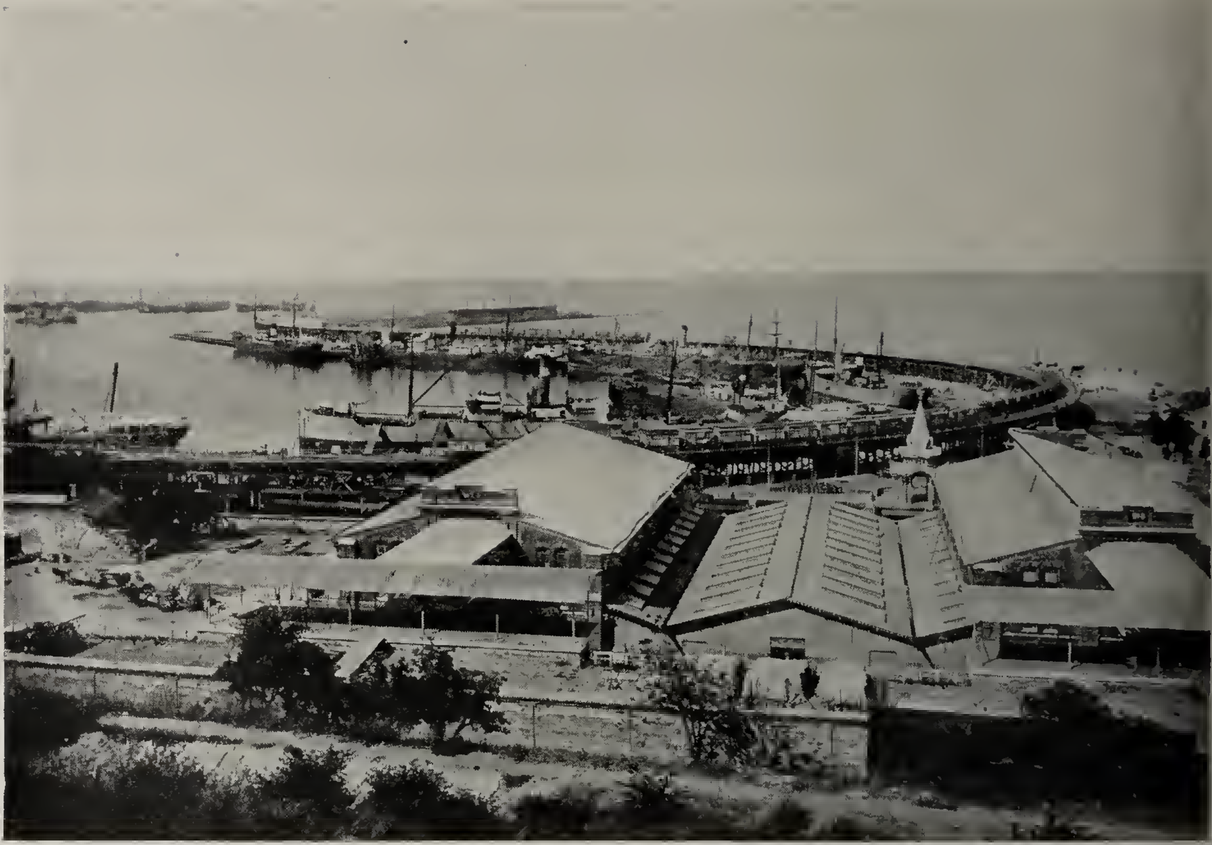

FIG. 8.

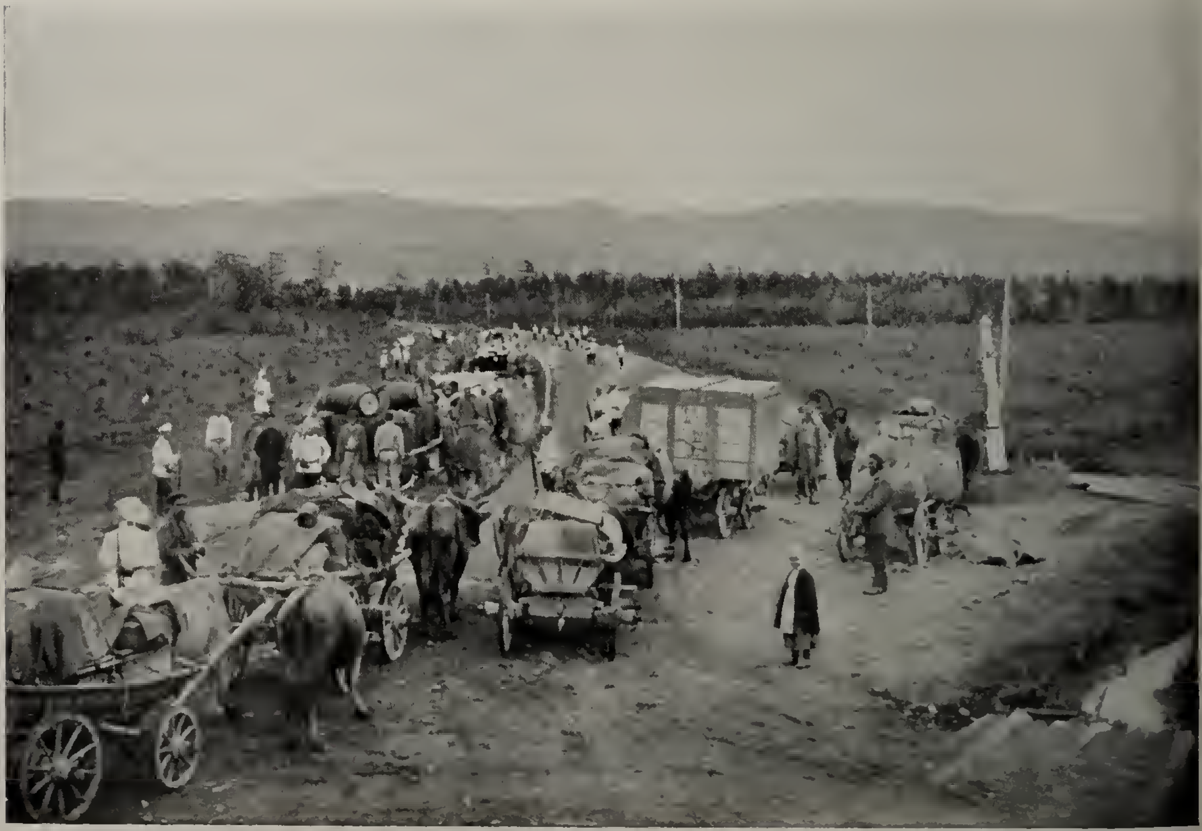

FIG. 9.

FIG. 8—The harbor of Odessa.

FIG. 9—Emigrating to Siberia. (Photo copyright by Underwood & Underwood.)

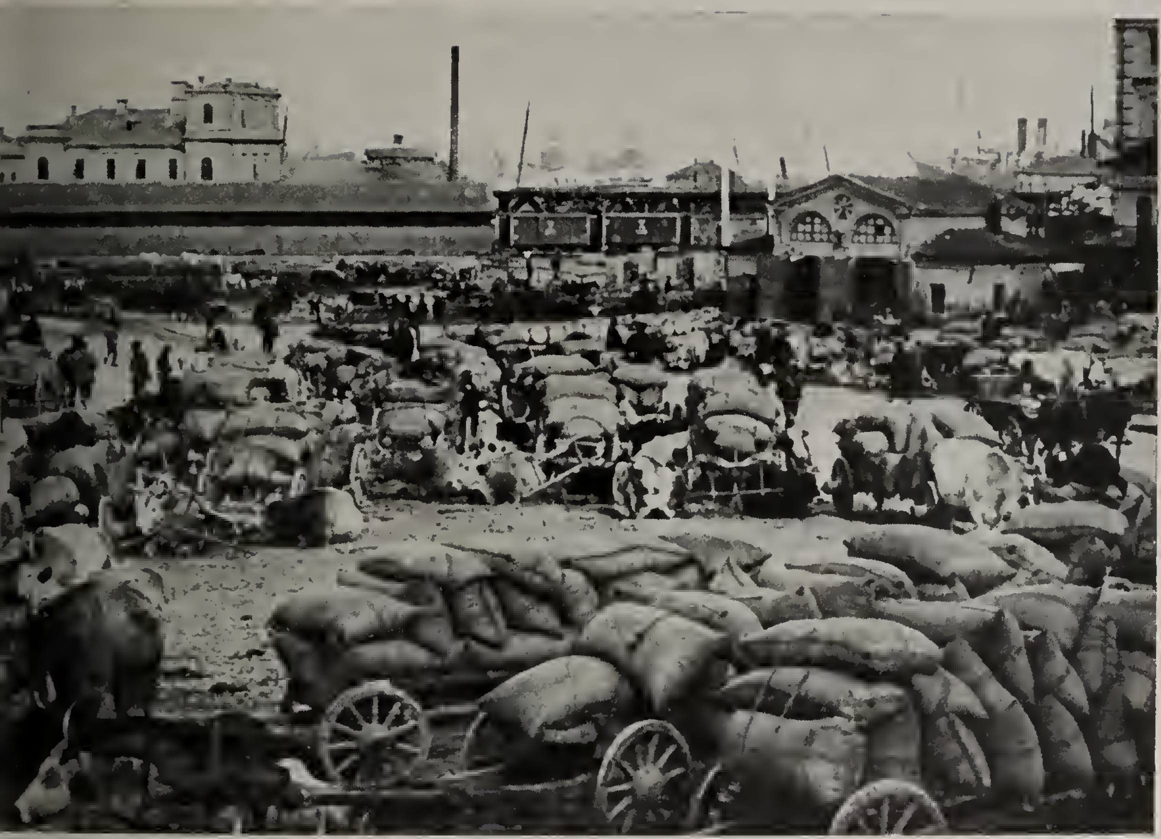

FIG. 10.

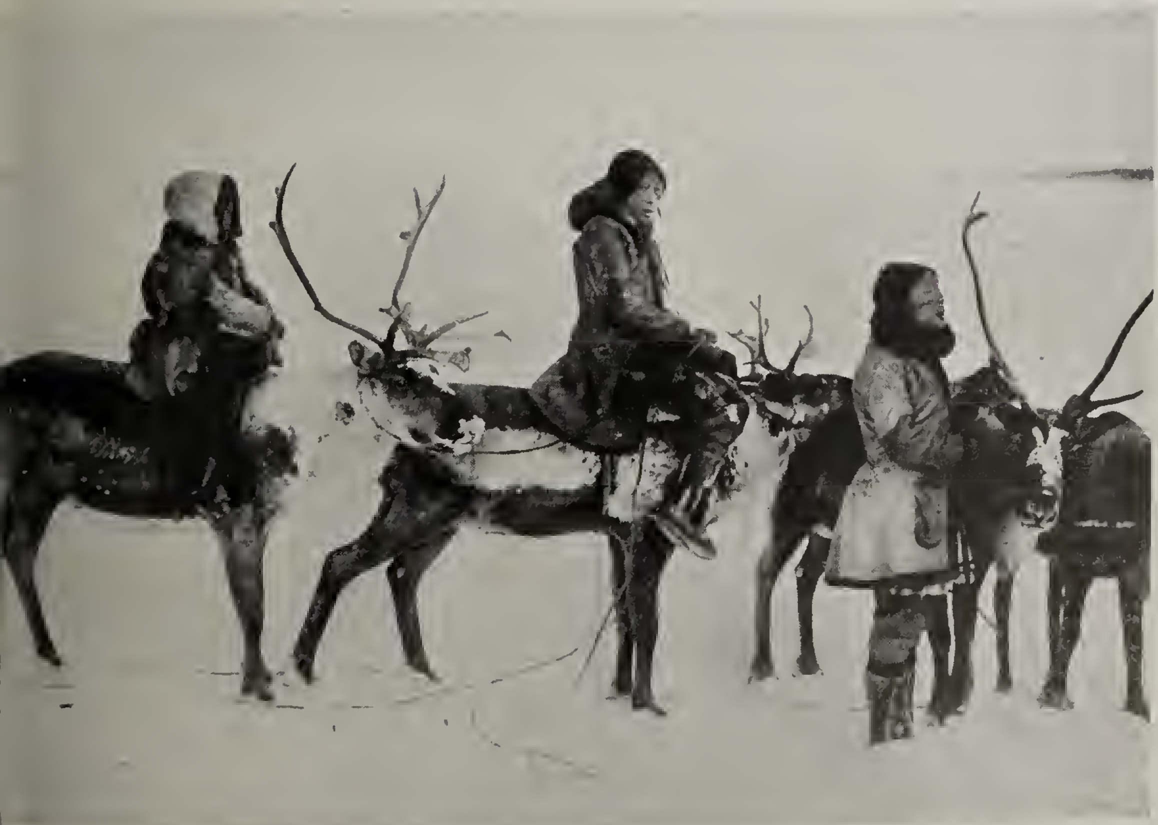

FIG. 11.

G. 10—Wheat for export at Odessa. (Photo copyright by Underwood & Underwood.)
G. 11—Yakuts with reindeer on the Siberian tundra. (Photo copyright by Underwood & Underwood.)

Another of Russia's valuable natural resources is her petroleum. I this, America is her successful rival. Her principal oil wells, discovere centuries ago by fire worshippers, were badly injured by having wat turned into them during the revolution of 1905-1906. In 1901 the output Russian petroleum was 50.6 per cent of the whole world's product, while t American petroleum was only 41.2 per cent. The Russian production 1901-1905 fluctuated 10 per cent, but the American production was dev oping more rapidly, and Russia began to lose, so that in 1913 Russia ha only 18 per cent and the United States 63 per cent of the world's outp of petroleum, but the export of naphtha and naphtha products from Russ reached $24,000,000 in that year.

Russia is also rich in copper, an uncomputed wealth. In this industr America is again her more than successful rival, producing 55 per cent the world's total output, while Russia produces only 3½ per cent. Russ uses about 4,000 tons of American copper a year—after it has been met morphosed in Germany into lamp-burners, etc. Nevertheless, Russia h extensive copper ore in the Ural Mountains, the Caucasus, in the Alt Mountains, and in Siberia. In that part of the Urals which extends into t Arctic immense beds of copper have been discovered.

Zinc and lead are also among Russia's undeveloped resources; Polar now in German hands, has the richest deposits, but the Caucasus is full both metals. North of Vladikavkaz, on the northern slope of the mountai above Tiflis, large quantities have been discovered, and immense depos of lead have been found in the sea coast region of the extreme east, no of Vladivostok.

The smelting industry, however, is still quite undeveloped, and t crude ore is very often shipped to European Russia or western Euro to be smelted.

Of precious metals and stones, Russia also has her share. The wh hem of her frontier towards the southeast and China is embroidered w gold, silver, platinum, and precious stones. In the Altai Mountains, p of the chain that closes in the Empire to the southwest of Lake Baikal, th are some of the largest gold mines of the world, surpassed only by those California and the Transvaal, and all along the Lena River and the sh of the Sea of Okhotsk, there are vast deposits of gold. The Urals are, p haps, the greatest treasure house, for besides the enormous quantities metals, base and precious, which they contain, they have a wealth of bea ful semi-precious stones, clear and colorful. In Perm, a city in the Ur a large stone-polishing industry has been developed on account of th and here they are transformed into the most delicious and radiant dr of color.

Then there are the fisheries, the salt works in the steppes, and an inf tude of industries, big and little, taking form, most of them being est lished by foreigners, for the Russian very frankly says that his indust ift is very slight and languidly presents the samovar as the only Russian nvention—an overstatement of the case perhaps, but the fact remains that or the understanding of machinery and business, he has continued to use ther people's brains, so far mostly English and German. But whatever the ol Russia may choose, there is an extraordinary unanimity of belief in e greatness of her future.

Is it to come from her potential economic wealth, or from the evident enius of the Slav race? By virtue of her national landscape or from the reatness in the soul of her peasant?

To us Americans, Russia has long been an unknown quantity. Distorted xpressions of her spirit have come to us from time to time, but of the onformation and content of her land we have known little and cared less. f this one seventh of the world's surface we have remained in almost total gnorance, but now, at last, we are trying to see the whole figure of this oungest child of Europe, both spirit and form, and we find we have many utual bonds. We both know the hunting of game and the felling of trees n the forests of the north; we both feel the pulse of our national life as e wind sweeps over the grainfields or the prairie pastures; we both have ur high mountains, deep mines, and swift-flowing, full-flooded rivers. utwardly we are much alike. But there is a difference—a very great dif-
rence. Russia is a country of age-long culture, a culture which she as preserved at the point of her bared sword, in the presence of death. e are the baby of golden-spoon fame; all conditions have combined favor the prosperous economic development of our country. In strug-
ling to preserve her traditions, she has been unified, and strengthened. he has lived continually in the presence of the other world. History has ade Russia into a heart. We have not been knit together as a race in the ace of a common foe; we have not had to suffer—history is making of us brain. Yet, given the practically identical geographical conditions under hich to live, it is only natural that we should lean towards each other and n the basis of what we share in common perhaps pave the way to an xchange of those things which we need from each other. Russia's needs re easily read: she is an all-on-land empire, and she needs railroads and ore railroads; she needs machinery; she needs the organization and push business enterprises for which we have become famous. All that side of ur life could be profitably shared by Russia; and for us, besides the aterial gains which needs must result from such relations, will come a nowledge of the spirit which has made and kept her a great nation and hich promises so much for the future. In human beings the balance be-
ween head and heart is known as genius, and something akin to genius ight surely be expected from such a bond.

AËROGRAPHY, THE SCIENCE OF THE STRUCTURE OF THE ATMOSPHERE

By ALEXANDER McADIE
Harvard University

Except in its relation to aëronautics, few people appreciate the signi cance of upper-air exploration. It is much more than the getting of hig level temperatures, interesting as these may be. It is the prospect of wider knowledge of the aërial ocean which lures the meteorologist. Un this work be accomplished, a man looking up at the clouds and with map giving only surface conditions, can know no more about the sea air above him than primitive man knew of the sea of water when he fi ventured upon it. Small wonder that meteorology has made such sl progress in forty years; no wonder that weather maps seemingly ali should be followed by different conditions.

The term *aërography* is new, making its initial appearance perhaps wi this article. Its meaning remains to be given; and at present we c hardly hope to do this so fully and completely that later modification w not be necessary. Like its analogues *geography* and *hydrography,* aër raphy, taken literally, means a description of the air. In the past fo or five years the term *aërology* has been used in connection with the explo ation of the upper or so-called free air; but it would seem more appropria to let this term embrace the whole domain of atmospherics, while the wo aërography might well be restricted to a description of the atmosphere various levels. The flow and counter-flow of the air, the pressures, temp atures, humidities, dust content, electrical charge, etc., would thus be prop subjects for consideration under aërography, as well as their functions a relation to life; but such broader questions as the evolution of the atmo phere, its relation to the planet and to planetary phenomena, would appropriately discussed under aërology.

Through the initiative of two non-official aërographers, the late Teissere de Bort and the late A. Lawrence Rotch, it has recently been establish that the atmosphere is not of a homogeneous and uniform character b consists of two great divisions, a lower region, where temperature falls wi elevation, and an upper region (in general higher than nine kilometers where the temperature increases with elevation. The latter has been call the isothermal region, but such a name is rather misleading and should discontinued in favor of Teisserenc de Bort's term *stratosphere*. The low portion may appropriately be called the *troposphere*.

Pioneer but none the less excellent aërographies are "Charts of t Atmosphere for Aëronauts and Aviators," by A. Lawrence Rotch a

ndrew H. Palmer, published in 1911,[1] and the "Structure of the Atmos-
here in Clear Weather," by C. J. P. Cave, 1912.[2] The introduction to the
rst-named volume is so brief and tells its story in such a straightforward
ay that we may well quote it entirely. Professor Rotch says—

> "Although the exploration of the air, which was begun twenty years
go in France and Germany and at Blue Hill, was undertaken for the
lucidation of meteorological problems, yet much of the data obtained is
f importance for the new art of aërial navigation. Accordingly, some of
e information which has been gathered by the Blue Hill Observatory in
e United States and on the Atlantic Ocean through co-operation with a
milar French institution, is here presented in a practical form for aëro-
auts and aviators. The term aëronaut is used to designate the pilot of a
alloon, while aviator is restricted to the pilot of a flying-machine heavier
an air.
>
> "Thus the work which Lieutenant Maury did fifty years ago for the
rface winds and ocean currents is now extended into the overlying ocean
f air. This is the more necessary, since the whole aërial ocean is subject
stronger commotions than even the surface of the aqueous ocean and is
avigable throughout a depth equal to that of the latter.
>
> "The following charts, which are believed to be the first of the kind
lapted to the use of airmen, relate only to portions of the United States
nd the Atlantic Ocean, but they will doubtless be perfected by aërologists
d extended in the near future to other parts of the globe."

Cave's book is essentially an investigation of the wind currents in the
ght of the results obtained by sounding-balloon work in Great Britain.
ertain structural types are recognized and considered in their relation
the surface wind, the gradient wind, and the general pressure and
mperature distribution. The strongest air motion or wind is found just
low the stratosphere; and it would seem that pressure changes originate
this region and probably control conditions throughout the lower atmos-
ere. We may note here the somewhat startling suggestion of Dr. W. N.
aw[3] that wind variations may better be referred to this upper level than
the surface. Cave is of the opinion that such a base simplifies the prob-
m. For example, working downward, he finds[4] that in a certain ascent
ept. 15, 1911) the west-east component of air flow decreased from +32
/s. (meters per second) at a height of 9 kilometers to —8 m/s. at 1 kilo-
eter. This means that the *flow was reversed with approach to the earth's
rface.* Similarly the north-south component decreased from +12 m/s.
—10 m/s.

Aërographers, then, may well begin their work with these two volumes
Rotch and Cave. If the titles sound somewhat strange to our ears let
recall the quaint expression used by the Dorset squire, Robert Boyle,

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[1] 24 full-page charts, with descriptions. John Wiley & Sons, New York, 1911. (Review in *Bull. Amer.
gr. Soc.*, Vol. 44, 1912, pp. 861-862).

[2] xii and 144 pp. University Press, Cambridge, 1912. (Review in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913,
2.)

[3] *Quart. Journ. Royal Meteorol. Soc.*, Vol. 38, 1912, pp. 46-48, and *Nature*, Vol. 88, 1911-12, p. 141.

[4] *Op. cit.*, p. x.

in his book published in 1660, entitled "The Spring of Air." This volun undoubtedly marks the beginning of positive knowledge regarding tl physical processes of the atmosphere, for, crucial as were the experimen of Torricelli, Pascal, and von Guericke, it was Boyle who showed us tha the air was elastic; and his law of pressure and volume relation, expande later into the characteristic equation of a pure gas, lies at the bottom our modern thermodynamics.

We shall appropriate the term "structure" from Cave, for aërograph must be, in essence, a description of the structure, or make-up, of the atmo phere. But every structure must rest upon a base; and in aërography may be necessary to discard the old sea-level plane so familiar to us, bu now known to be of somewhat doubtful value, when atmospheric conditio over continental areas are to be reduced downward. How can we g another base plane? It may be remarked at this point that it is a difficu matter to adequately represent atmospheric conditions on a flat map. Tl daily weather map in its present form—and there has been practicall no change in forty years—by no means represents conditions at the botto of the ocean of air; and perhaps much of the uncertainty of forecastin may be traced to faulty graphics. Again, the aërographer must be ab to show on the base not only pressure and temperature gradients, bu water-vapor content and, for lack of a better name, dust load, meani thereby small and large nuclei of condensation, ions, and electrons. An it will be a great step forward when these can be shown for all level Then, as a geographer would chart continents, coasts, and islands, tl aërographer would chart hyperbars and infrabars—regions of excessi air flow and regions of no flow or stagnation—also levels where the inte change of air was mainly by "advection," or horizontal motion, and whe the interchange was by "convection," or vertical motion, using terms intr duced by Ernest Gold in his prize essay on "The International Kite an Balloon Ascents."[5]

With such a base map and such auxiliary charts the winds and clou will take on a new significance and can be studied to advantage. Tl layman as well as the expert would be able to follow the general circulatio and follow intelligently the average west-to-east drift around one pole an the reversal at the other. Interruptions and displacements of the great a streams could be correlated with abnormal weather conditions and give firmer ground in forecasting. At present one must applaud rather tl valor of the forecaster than the value of the forecast. Such charts wou go far in settling discussions regarding the origin of cyclones and ant cyclones, discussions which, so long as they are based upon present char of air flow, must continue to be unsatisfying.

Returning again to the apparent structure of the atmosphere: As ind cated by the models used by Cave, it would seem to be entirely feasible show the sequence of wind velocities and directions at various levels appropriate to certain types of weather and certain seasonal conditions. Let us also consider Shaw's suggestion of the stratosphere as the principal plane of reference. It may seem strange to attempt to use so variable a level as the base of the stratosphere, yet it may be after all most appropriate, since the atmosphere is itself variable and mobile. The geographer deals with a solid earth, and there is no flow horizontally or vertically. True, we live upon a rotating geoid; but our sensations and impressions are such as would be common to dwellers upon a flat surface. We are handicapped n comprehending air motion because all our experiences are based upon mpressions of level and fixed planes. We are, for example, absolutely unconscious of any deflective effect of a moving air current due to the earth's rotation.

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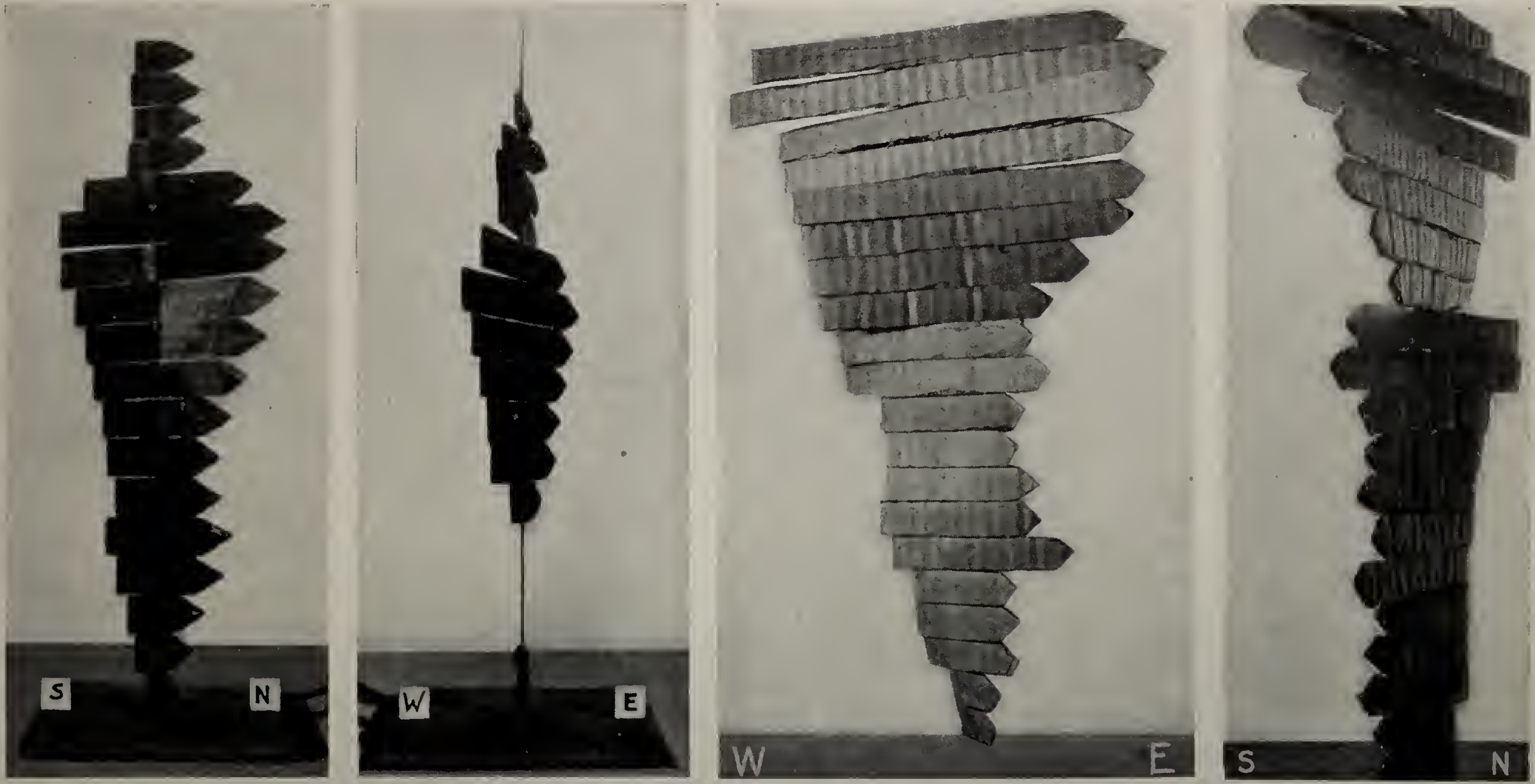
[5] *Geophysical Memoirs No. 5* (= pp. 61-144) Meteorological Office, London, 1913. Reference on p. 109.

It is a peculiar fact about the stratosphere and one full of significance that it does not remain at a fixed height but varies with season and lattude. At the equator, as we rise in air, the temperature continues o fall to a much greater height than in temperate latitudes. Indeed the owest temperature, probably the lowest natural temperature, is found above the equator. This state of affairs was anticipated by Teisserenc de Bort and Rotch and has now been proven by certain ascensions. Thus at Batavia, Java, on December 4, 1913, the sounding balloon reached a height of 26 kilometers, entering the stratosphere at 17 kilometers and recording a temperature of 192° A (—112°F). In other words, the stratosphere is highest over the equator and lowest over the poles, so far as we know.

Expression of air flow, then, is the first desideratum in aërography. The aërographer, however, is at present in something of the quandary in which a geographer would be who depended upon a scale of distance that could be applied only in one direction. A map based on such coordinates s, of course, of limited value, and this is true in aërography if we measure only horizontal and not inclined and vertical flow.

Investigators have been singularly slow in measuring and expressing air flow. Records of horizontal flow date back to the middle of the seventeenth century, or rather began about that time in Italy; but the measurement of vertical flow is still wanting, although W. H. Dines emphasized the need in 1887 and gave us a new form of anemometer. The whole series of wind measurements made in various official weather services throws little light on the vertical movement of the air. And what is still more disheartening, there is a very large error in the horizontal velocities as published.

It is of the utmost importance that we know something or have some way of representing the vertical component of motion of the air. The formation of rain, local and general air drainage, pressure gradients, and temperature gradients are affected by the duration and strength of ascensional and descensional currents. In aëronautics, too, this matter is important.



FIGS. 1 to 4—Models representing vertical wind distribution.

Figures 1 and 2 represent the conditions at Ditcham, Hampshire, England, on October 1, 1908; Figures 3 and 4, the conditions at Blue Hill Observatory, Mass., on August 12, 1910. Each model is shown from two sides (Figures 1 and 4 from the east, and Figures 2 and 3 from the south) so that the orientation of the arrows may be seen. The arrows fly with the wind; the length indicates the velocity at that level. In Figures 1 and 2 each arrow represents an air stratum of 1,000 meters and in Figures 3 and 4 of 500 meters.

Figures 1 and 2 are taken from Cave's "The Structure of the Atmosphere in Clear Weather," 1912. Figures 3 and 4 are from models based on soundings made at Blue Hill Observatory.

n a recent paper[6] we find the conclusion that on cloudless days the average pward velocity at the given point was about 0.5 meter per second, while n days with detached cumulus clouds the average velocity was about 2 eters per second.

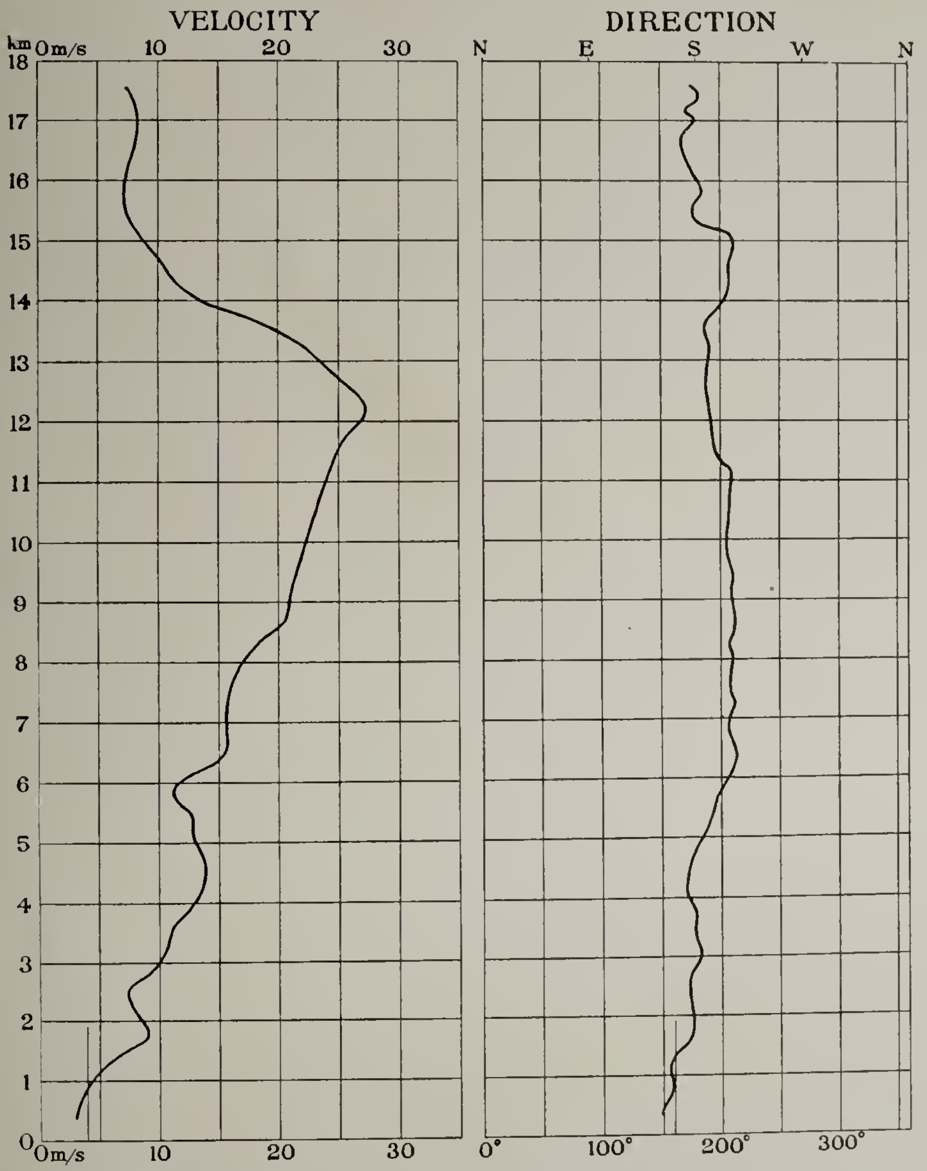


FIG. 5—Diagram showing, for the wind conditions at Ditcham, England, on October 1, 1908, represented by the model of Figures 1 and 2, the relation of velocity and direction to height. Based on a figure in Cave's "The Structure of the Atmosphere in Clear Weather," 1912.

The sounding balloon was watched until it burst, and the highest point deduced from the meteorograph trace was used as the highest point for wind observations; up to 4 kilometers the wind observations were deduced from the two-theodolite method; above this the balloon was supposed to have a uniform acceleration up to the highest point reached, and the wind velocities were calculated on the one-theodolite method.

But the running of the air—to translate literally the old Greek defini- on of wind—is not a steady, uniform, and continuous motion. On the con- rary the flow is frequently of an intermittent character. There are lulls and usts; and there are eddies and vortices, small and large. This uneven-

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Report on Wind Structure No. 4 (for 1912-13): Papers by J. S. Dines. Meteorological Office, London, 1914.

ness of flow was brought out clearly by Professor S. P. Langley in his paper on "The Internal Work of the Wind."[7] In the light of present achievements in aviation it is interesting to read his statement, which seemed so fantastic when written, that an indefinite source of power for the maintenance of mechanical flight might lie in this unevenness of flow, which he called the internal work of the wind. And he adds, what is of some importance in aërography, that "the actual effect of the free wind, which is filled with almost infinitely numerous and incessant changes of velocity and direction, must differ widely from that of a uniform wind such as mathematicians and physicists have almost invariably contemplated in their discussions."[8]

In order to illustrate with more detail the structure of the free air as determined by modern soundings, we have borrowed from Cave's book one of the many models shown (Figs. 1 and 2). This represents the wind distribution on October 1, 1908, seen from the east and from the south. The greatest height in this case was 17.6 kilometers. The diagram (Fig. 5) shows the relation of wind elements to heights.

The structure indicated by Figures 3 and 4 is that of a typical mid-summer fair-weather day on the New England coast. There was no sea breeze nor even the northeast inflow found frequently under anti-cyclonic conditions. The structure is exceedingly uniform. In the lower strata the velocities average from 2 to 6 meters per second, and the flow is fairly steady in direction horizontally. There is a tendency to shift to the north up to about 2,800 kilometers, then an increasing westerly component. The sky was practically without clouds. An extensive high area moving east at a normal rate overlay the eastern half of the United States. In the Ohio Valley and Lake Region the pressure ranged from 1,020 to 1,025 kilobars. The twenty-four hours following were without rain in Ohio, Pennsylvania, New York, and New England. In fact the day was a typical fair day, and the structure may be said to indicate a certain stability and absence of turbulence.

In general the sub-stratosphere is the region of maximum air motion. Again, the modification of wind direction seems to progress downward. Perhaps I can not do better than sum up the impression which such models of structure give than by quoting the words of Dr. W. N. Shaw:[9]

"It appears that we must regard the sub-stratosphere and the regions above as the dynamical laboratory of the atmosphere, where the main causes of pressure changes originate, and the troposphere beneath the sub-stratosphere as the physical laboratory of the atmosphere, where cloud, rainfall, and other physical phenomena are produced by local causes.

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[7] *Smithsonian Contributions to Knowledge*, Vol. 27, No. 2, Washington, 1893. 23 pp.

[8] Langley Memoir on Mechanical Flight, *Smithsonian Contributions to Knowledge*, Vol. 27, No. 3, Washington, 1911. 320 pp. Reference on p. 42.

[9] The Free Atmosphere in the Region of the British Isles: Second Report. By W. H. Dines, with a preface by W. N. Shaw. *Geophysical Memoirs No. 2* (= pp. 11-50), Meteorological Office, London, 1912. Reference on p. 22.

induced, in some cases, by the effect of the dynamical changes in the upper regions.''

Thus far we have laid stress on the flow of the air. But temperature and other data are also available. Thus W. H. Dines[10] has given us the normal isopleths of temperature and also pressure from sea level to a height of 20 kilometers and curves showing the local difference from the mean temperature for each level. The Geophysical Institute of Leipzig, under the direction of V. Bjerknes, is publishing a series of synoptic charts for three-day periods of the year 1910 showing the conditions at different levels.[11]. The atmosphere is divided into ten principal isobaric levels. In the last number issued, representing the period August 8, 9, and 10, 1910, the stations furnishing soundings were Trappes near Paris, Uccle near Brussels, Pyrton Hill near London, Crinan near Glasgow, Oughterard on the west coast of Ireland, Manchester, Pavia, Friedrichshafen on Lake Constance, Strassburg, Hamburg, Lindenberg near Berlin, Vienna, Pavlovsk near Petrograd, Nijni-Oltchedaeff in southwestern Russia, and Munich. There were also auxiliary cloud observing and mountain stations. With the data for these stations we can at once construct over Europe the heights in dynamic meters for each stratum of 100 kilobars and also what may be called the relative topography, i. e. the value in dynamic meters between each successive level, or, in other words, the gradient for the aërographic topographer.

Thus the making of aërographic surveys is already under way. Perhaps the day is not so far distant when charts of air structure will be available for consecutive tri-hourly periods for the use of aviators and aërial engineers, for the time is rapidly approaching when problems of transportation via air routes must be considered.

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[10] *Op. cit.* sub 9, p. 29.

[11] Synoptische Darstellungen atmosphärischer Zustände: Jahrgang 1910. *Veröffentl. des Geophys. Inst. der Univ. Leipzig:* Heft 1, Zustand der Atmosphäre über Europa am 6. Januar 1910 (Leipzig, 1913); Heft 2, —— am 2., 3. und 4. Februar 1910 (Leipzig, 1913); Heft 3, —— am 18., 19. und 20. Mai 1910 (Leipzig, 1914); Heft 4, —— am 8., 9. und 10. August 1910 (Leipzig, 1915).

THE NICHOLS MO-SO MANUSCRIPT

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That charming book, "Through Hidden Shensi," made the late Mr. Francis H. Nichols widely known to the public, but few are acquainted with his high aspirations in attempting to acquire the Tibetan language by leading a solitary life for a considerable time in the lama monastery of Wei-si in the prefecture of Li-kiang, Yün-nan Province.[1] On arriving at Mandalay, Burma, on September 20, 1904, he sent the following note: "My greatest treasure I enclose. It is a book in the Ton-ke, the original language of the Mo-so tribe, who now speak and write Tibetan. Books like this one are exceedingly rare and difficult to obtain. I consider myself fortunate in having secured this manuscript. Part of it I have been able to translate."

It is a pleasure to respond to the request of the American Geographical Society for some comment on this rare and valuable Mo-so manuscript which he presented to the Society. The designation Ton-ke, which is used by Mr. Nichols, is composed of *ton,* or what other travelers style *tong-pa,* the name for the shamans, or sorcerers, of the Mo-so, and the word *ke* (Tibetan *skad,* pronounced *kä*), which means "language." The hope that the partial translation of the manuscript might be preserved has unfortunately not been fulfilled. Mr. Nichols' mother, Mrs. William C. Nichols, of Evanston, Ill., states that this translation has not been found in his papers, or has never reached her.

At present the Mo-so inhabit the Chinese prefectures of Li-kiang and Ho-k'ing in the province of Yün-nan. They represent the remnants of a once powerful and more extended tribe (or even several tribes), which belong to the Tibeto-Burmese stock of the large Indo-Chinese family. Their idiom, as far as we can judge at present, shows decided affinities with Tibetan and Lo-lo; it is, however, not merely a Tibetan dialect, but an independent language with peculiar characteristics. The name Mo-so is applied to them by the Chinese and presents the combination of two tribal names, Mo and So. They style themselves Na-shi, and are called by the Tibetans Jang. The latter term appears in Kara-jang, the medieval designation for the province of Yün-nan, applied to the latter by Marco Polo and the Persian historian Rashid-eddin.

For all that we know thus far about the history of this people we are indebted to the records of the Chinese. The Mo-so are first mentioned under the T'ang dynasty (608-916). Toward the end of the eighth century they were subjugated by Yi-mou-sün, ruler of the kingdom of Nan-chao in Yün-nan, which was composed of members of the Tai or Shan stock, the ancestors of the subsequent Siamese. Under the Sung dynasty, Mong-ts'u, the chief of the Mo-so, captured the town of Li-kiang. The Mongols, after their conquest of Yün-nan, established two departmental districts in the Mo-so territory, called Tsaghan-jang and Kara-jang, that is, "White and Black Jang."

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[1] An account of lamasery life at Wei-si from Mr. Nichols' diary was published in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 100-114, where further details of his travels in China may be found.

In former times the Mo-so were very warlike tribesmen, fighting many a battle with their Tibetan neighbors, and were even bold enough to invade the southeastern portions of Tibet. The memory of this heroic age is preserved in the great national epic poem of the Tibetans, the Gesar Saga, divided into three sections, one of which is devoted to the struggle of the Tibetan warriors with the Mo-so.

There is a Chinese chronicle devoted to the history of the chiefs of Li-kiang, who from the year 1382 bore the family name Mu. This work has been translated and interpreted by E. Chavannes.[2] It contains an interesting genealogy of the Mo-so chieftains from the beginning of the twelfth to the first part of the seventeenth century. To the industry of P. Cordier, the eminent bibliographer of the literature relating to Eastern Asia, we owe an excellent summary of what has been written on the Mo-so.[3] This study also contains a Mo-so vocabulary.

What renders the Mo-so particularly interesting is a peculiar pictographic system of writing and a religious literature composed in it and extant in a number of manuscripts. T. de Lacouperie, the versatile orientalist, was the first to take an interest in this matter and to publish facsimiles of two Mo-so manuscripts procured by Captain W. Gill and Father A. Desgodins.[4] He made several very ingenious observations on the script, but owing to lack of information he was unable to make a statement as to the contents of the manuscripts. The beginning of the same manuscript acquired by Desgodins was reproduced also by G. Devéria,[5] likewise without explanation. Prince Henri d'Orléans brought back five Mo-so manuscripts from his journey in 1895-96 and figured the first three pages of two of them, accompanied by a translation and transcription of one of the texts.[6]

The first scholarly contribution to Mo-so literature was made by Monsieur Charles-Eude Bonin, at present Consul-General of France in Montreal, Canada.[7] In 1895 he was charged with a mission along the borders of

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[2] Documents historiques et géographiques relatifs à Li-kiang, *T'oung Pao*, 1912, pp 565-653; also reprinted in the work of J. Bacot: Les Mo-so, pp. 127-215 (Leiden, 1913).

[3] *T'oung Pao*, 1908, pp. 663-688 (compare also his article on the Mo-so in *Journ. des Savants*, 1911, pp. 129-134).

[4] T. de Lacouperie: Beginnings of Writing in Central and Eastern Asia, pp. 45-50, Plates I-III (London, 1894). The manuscripts were first published in the *Journ. Roy. Asiatic Soc.*, 1885.

[5] La frontière sino-annamite, p. 166 (Paris, 1886).

[6] In his book "Du Tonkin aux Indes," pp. 364-367.

[7] Note sur un manuscrit Mosso, *Actes du onzième Congr. Intern. des Orientalistes*, 2d section, pp 1-10, Paris, 1898. This article is reprinted and generally accessible in the author's book "Les royaumes des neiges: États himalayens," pp. 281-296 (Paris, 1911).

Tibet and had the opportunity of traversing, as the first white man, the territory of the Mo-so. He visited also its capital, Li-kiang, and was fortunate enough to secure a Mo-so manuscript from a native priest, a so-called *tong-pa* (in Chinese, *to-pa*). The latter are the shamanistic sorcerers representing the aboriginal form of religion that obtained in times prior to the introduction of Buddhism among the Mo-so people from Tibet. A certain affiliation still exists between the Buddhism of Mo-so land and the Lamaist church of Lhasa. Capable Mo-so men are recruited by the Tibetan lamas for the ecclesiastic army and sent to Lhasa in order to receive the benefit of a religious and theological education. Despite this official conversion to Buddhism the adherents of the primitive native religion still hold their ground, and it is their principal ritual that is contained in the book secured by M. Bonin. The poor *tong-pa* who transmitted it to him secretly made a translation of the first six pages into Chinese, which was recorded by a Chinese interpreter, and it is on this Chinese version that M. Bonin's French rendering is based. The original manuscript, unfortunately, is not reproduced by him, but we trust that M. Bonin, in the interest of science, will be induced to publish it in the near future. The description given of the manuscript shows that in its technical make-up and appearance it comes very near to the manuscript of Mr. Nichols. Like the latter, it is an album of oblong size, comprising twelve folios of very strong paper, the verso and recto of each leaf being inscribed, save the last page, which is decorated with designs of red flowers. The two sides of the first folio are occupied with representations of deities and objects of the cult. The ten following folios are covered with colored hieroglyphs peculiar to the writing of the *tong-pa,* and on each page distributed over three horizontal lines, each line being divided by vertical strokes into two or three sections. These form a series of rectangular enclosures, the characters of each quadrangle representing a phrase, so that the vertical lines assume the function of our punctuation. M. Bonin insists on the strictly hieroglyphic character of Mo-so writing, saying that nearly all characters directly picture the object for which they are intended. Likewise he lays emphasis on the indigenous origin of the system, which appears not to contain any elements borrowed from the script of the Lo-lo or the Chinese. The notable foreign elements seem to him rather to be derived from India, as, for instance, the design of the svastika, which is expressive of the idea of bounty. According to the vocabulary of J. Bacot[8] the symbol of the svastika would mean a "remedy." The manuscript of M. Bonin is the only one thus far known in which pigments are applied to the characters: that of Mr. Nichols and all others are written exclusively in black Chinese ink, and, apparently, not with a brush, but by means of a pointed wooden stylus, such as is in vogue among all present Tibetan tribes and as was employed also by the ancient Chinese in times prior to the invention of the writing-brush. In the Bonin manuscript the colors seem to bear out a symbolic significance, the idea of "earth," for instance, being conveyed by a blue band covered with bunches of grass.

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[8] Les Mo-so, p. 103.

It is difficult to form an opinion on the translation of the Mo-so ritual, as it is offered by M. Bonin. He himself admits that it should not be regarded as definite, but simply as an essay to make out a coherent concept of the ideographic characters, which merely convey notions of realistic objects without being capable of expressing the verb. A great antiquity is ascribed to his text, regarded as the product of indigenous religious thought, the original being traced to an epoch when the Mo-so were not yet in contact with Chinese or Mongols, and under their chief Mong-ts'u conquered the territory of Li-kiang. This conclusion is tempting, but it can be accepted only with certain strictures. First of all, the Indian-Buddhist influence transmitted through the medium of Tibet is quite apparent in this brief text, as particularly shown by the thirty-three spirits of heaven, which are mentioned twice. Every one familiar with Buddhist literature knows that these are the thirty-three gods, headed by Indra, of the Brahmanic heaven. Among the offerings made to the gods by the family we note "tobacco," and this is a recent element giving rise to suspicion. To be sure, it may be a subsequent interpolation smuggled into a text of older date, but a sacred ritual that is thus impaired and modernized can hardly lay claim to that purity of native atmosphere with which it is credited.[9] Be this as it may, the great merits of M. Bonin as a pioneer worker in the field of Mo-so literature remain uncontested.

An essential progress in the advance of Mo-so studies is signaled by the recent work of J. Bacot.[10] This energetic traveler and explorer has made not only most interesting contributions to the life and religion of the people but has furthered a great deal also our knowledge of their language and systems of writing. He is the first to have revealed the interesting fact that the Mo-so have not, as had hitherto been believed, merely one system of writing, but that they have at least two. Besides the pictograpic method there is a syllabic script; and the latter, again, appears in combination with the former, as the Japanese combine the syllabary of their Katakana or Hiragana with the Chinese characters. In its style and outward appearance the marks of the Mo-so syllabic system bear a certain resemblance to

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[9] Among the many curiosities of the Tibetan-English Dictionary, published in 1902 by Sarat Chandra Das, the well-known Bengali student of Tibetan and explorer of Tibet, we read (p. 565) that the evil drug tobacco (in Tibetan *tha-ma-kha*) appeared in ancient time about one hundred years after the death of Buddha, which would yield the date 377 B. C., and that mention is made of tobacco also in the writings of a lama who is dated in the twelfth century A.D. In 1908 I enjoyed the privilege of spending several months in "Lhasa Villa," the house of Das in Darjeeling, and when one evening, in the course of a learned conversation with him, I ventured to draw his attention to this chronological anomaly and the post-Columbian introduction of tobacco into Europe and Asia, he replied, "This is your tradition, and that (pointing to the passage in his dictionary) is our tradition; and our traditions certainly are as good as yours."

[10] Les Mo-so: Ethnographie des Mo-so, leurs religions, leur langue et leur écriture, par J. Bacot. Avec les documents historiques et géographiques relatifs à Li-kiang par E. Chavannes (Leiden, 1913, 41 plates and a map).

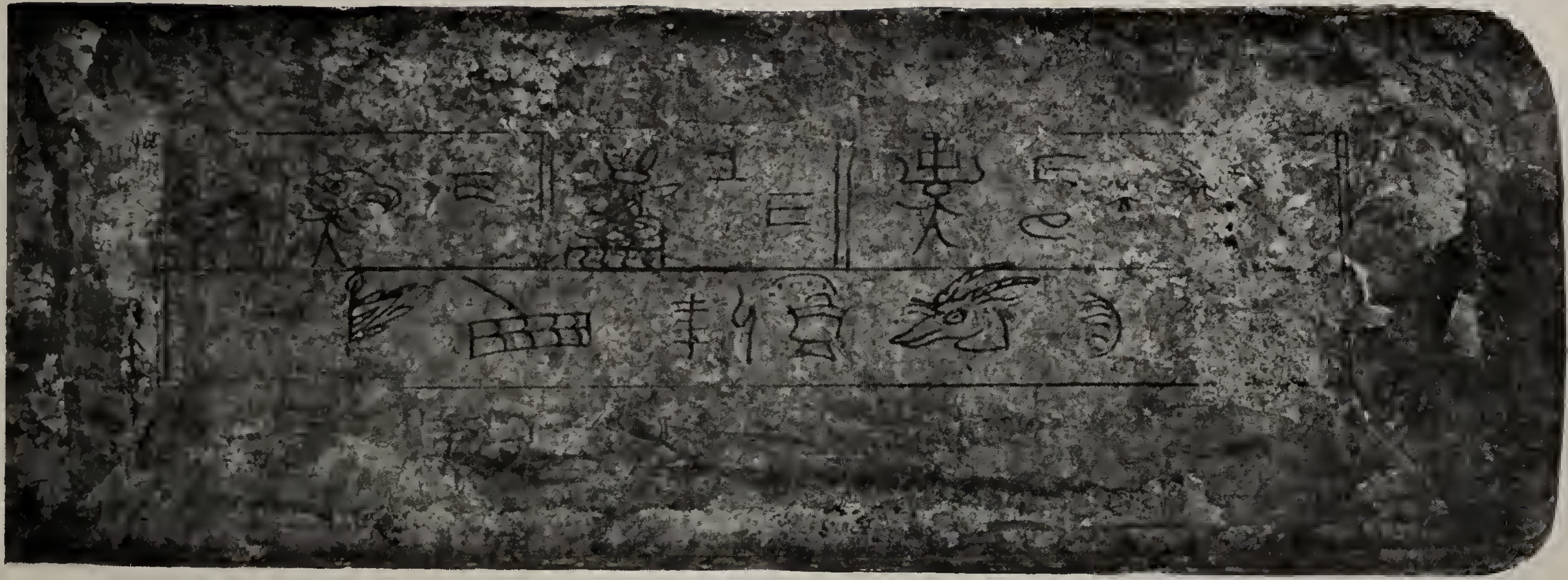
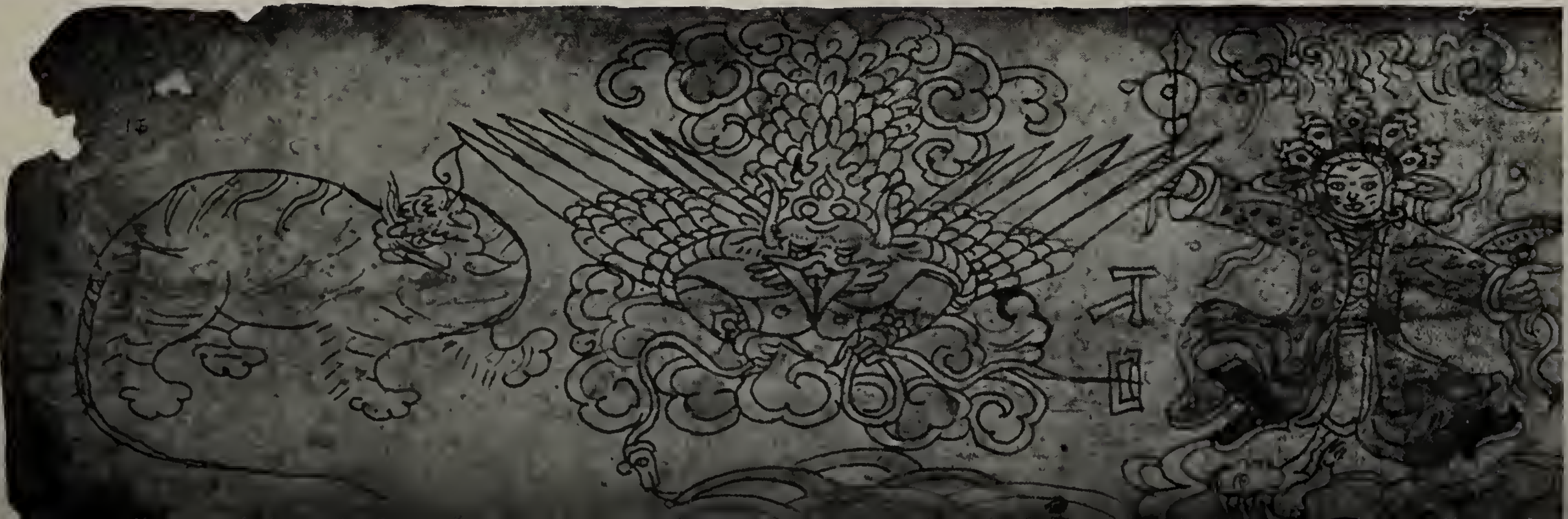


FIG. 1.



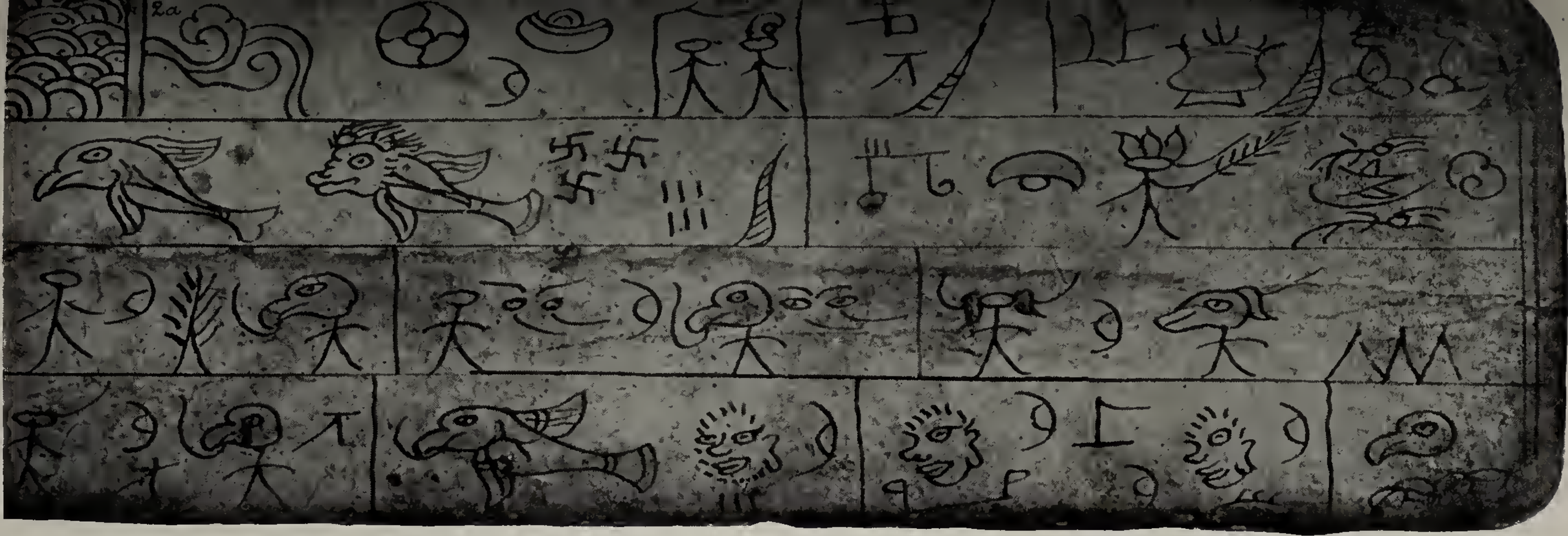


FIG. 3.

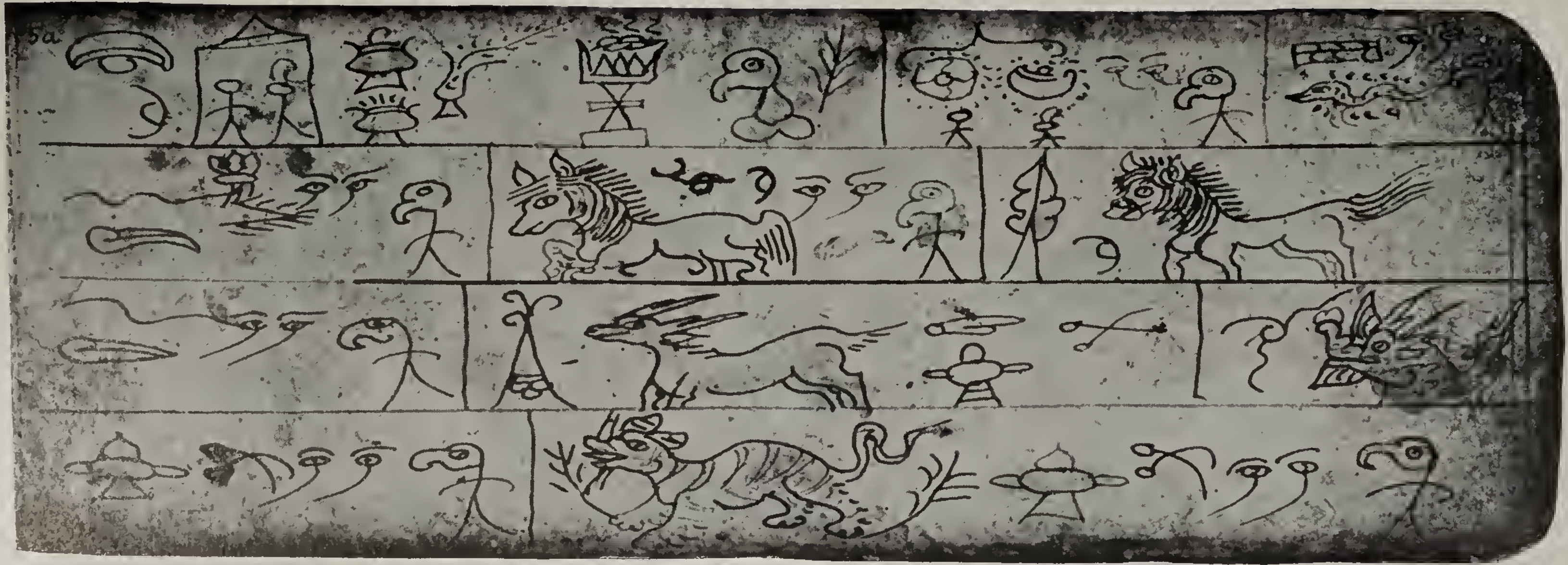


FIG. 4.

FIG. 3—Recto of the second folio (page 3).

FIG. 4—Recto of the fifth folio (page 9).

the Önmun alphabet of the Koreans; and the reason presumably is that like the latter, it may be traceable to the Indian Devanāgarī or an allied alphabet.[11] It is needless, however, to speculate on this point, as we are ignorant at present of the origin and history of the Mo-so syllabary. M. Bacot has published seven plates containing so-called Dhāranī (mystic prayer forms, spells, and charms) composed in this style of writing; and if the syllabary is with predilection chosen for this class of Buddhist literature, we may presume with some degree of probability that this script received its impetus from India. On pages 68-117 of his book a very useful list of Mo-so words is given with their pictographic and syllabic characters. As a foundation it is excellent, though it is certainly not complete, as we meet in the Mo-so texts numerous characters not yet explained. Our knowledge of the Mo-so grammar being only of the most rudimentary kind (the dictionary remains as yet to be made), it is impossible to decipher Mo-so manuscripts at home in the study. Such researches, naturally, can be pursued only in the field, in the midst of the Mo-so, with the assistance of native scholars or learned priests. It is hoped that some of the French missionaries who applied themselves so successfully to the study of the Lo-lo will soon attack also the Mo-so problem.

As regards the origin of the pictograph system of writing, M. Bacot reiterates the very interesting theory which had already been advanced by T. de Lacouperie.[12] He supposes that it is identical with the script which is said to have been in vogue among the Tibetan shamans prior to the seventh century. Forgotten in Tibet, it would have survived among the Mo-so, while its traces may still be recognized in certain pictorial charts employed by the Tibetans for purposes of magic. It is very likely that the realistic and partially conventionalized designs now serving the expression of ideas were in their origin religious symbols utilized in magic rites and devil exorcisms, or even purely ornamental motives. Certain it is that, in the same manner as the peculiar writing of the Lo-lo, the pictographs of the Mo-so bear no relation to those of the Chinese and are entirely independent in their origin and development. The Chinese Chronicle of Li-kiang relates that Nien-pao A-tsung, the son of the ancestor of the Mo-so chiefs, invented a system of writing for his country in the twelfth century, but we are left in ignorance as to what this writing was.

The Mo-so manuscript of Mr. Nichols consists of nine oblong folio leaves, measuring 28.3 x 9.7 cm. and sewed together on the left-hand margin by means of treble yellow-silk threads. The peculiar size is derived from that of Tibetan books, which, on their part, imitate the palm-leaf manuscripts of India. The writing, done by means of black Chinese ink, is apparently accomplished with a bamboo or wooden stylus. The paper is stiff and heavy and has assumed a yellowish brown color. Dr. C. F. Millspaugh, Curator f Botany in the Field Museum, who has a wide experience in the study f Oriental papers, has been good enough to examine the paper of this nanuscript, with the following result: "The paper employed in the fashionng of this book," he remarks, "is manufactured from the bark of *Streblus sper,* a rigid shrub or small, gnarled tree, belonging to the same botanical amily (*Moraceae*) that includes the paper mulberry. The tree is found n the dryer parts of India from Rohilkhand eastward and southward to ravancore, Penang, and the Andaman Islands. It is prevalent also in ochin-China, Siam, and the Malayan Islands. In Siam it forms the pulp or the famous *Laos* paper. There the bark is known as *Khoi* bark. In Siam he bundles of bark are soaked in water for two days, then steamed with ime for the same period, shredded, placed in earthen jars and steeped in lear water and lime for a few days, washed free of lime, beaten to a pulp vith wooden mallets, floated in water where the flakes of unmacerated bark nd knots are picked out, and finally floated out, squeezed, and layered into he thickness desired for pressure and drying into paper."

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[11] Compare W. G. Aston: Writing, Printing, and the Alphabet in Corea, *Journ. Roy. Asiatic Soc.*, 1895, p. 510.

[12] Beginnings of Writing, p. 48.

Four pages of the manuscript, which consists of nine folios of two pages ach, are reproduced herewith.[13] The title of the work is written in the enter of the front cover (Fig. 1), occuying two lines enclosed by rectangles, he symbols running from the left to the right, as is the case also in the ibetan alphabet.

The verso of the first folio (Fig. 2) contains three mythological repreentations which stand outside of the frame of the text proper, that begins vith the second folio. They are, so to speak, miniatures intended as bookecoration and selected with due regard to the contents and purport of he book. As will be seen, they even afford an important clue to reveal to s its subject-matter. The idea of placing miniatures in front of the book s borrowed from the Tibetans, who on their part have been inspired by raditions inflowing from India. The Lama artists are masters in the xecution of exquisite miniature painting in colors,—gold, silver, or black,— pread over the covers or the pages of a book. The animal on the leftand side of the Nichols manuscript is a tiger, well characterized by the hape of the head and the stripes of the skin. This identification is conirmed by a note of Mr. Nichols himself, who has accompanied it with a encil-mark reading *tag.* The latter word (written *stag*) is the general ibetan designation for the tiger and probably is also the corresponding Io-so word for it.[14] In the shamanism of Tibet (as well as in the shamanstic religions of Siberian peoples, particularly the Amur tribes) the tiger lays the rôle of a powerful deity. The central figure of Figure 2 repreents a subject of purely Indian mythology, the bird Garuda, the companion nd riding-beast of the god Vishnu. He is the inveterate enemy of the serpent-demons, the Nāga, and constantly engaged with them in a struggl of destruction. The Mo-so representation is perfectly in accordance witl indeed, an exact reproduction of what we meet in Tibetan art, and familia to all students of Tibetan iconography. The bird is outlined *en face* wit outspread wings, soaring above the clouds, with triangular hooked beak, seiz ing in its claws a snake whose head droops toward the left. The Nāga i an inhabitant of the water, and accordingly we see a sketch of wave-line along the lower margin, being symbolic of the watery element. The Garud is supposed to have wrested the Nāga from its abode; and the latter, a indicated by the downward position of its head, makes a supreme effor to be restored to its former home. Mr. Nichols has made here a pencil-not "phœnix," which may be an erroneous explanation given by his Chines interpreter.

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[13] Students desiring more information may consult the manuscript in the Society's library.—EDIT. NOTE.

[14] M. Bacot (*loc. cit.*, p. 108) gives *la* as the Mo-so term for the tiger, which is also the word of the Lo-lo. 'Ollone (Langues des peuples non chinois de la Chine, p. 64, Paris, 1912) gives the Mo-so word in the form *a* which is the same as Nichols' *tag*.

The most interesting of all is the figure on the right-hand side of thi page. We note what appears as a male deity clad with a panther's skin an boots of Chinese style, and crowned with a five-lobed diadem. He stand with straddling feet over a nude figure which lies on its back. In his righ hand he brandishes a rattle-staff (known in Sanskrit as *khakkara*), and i his left a tambourine (*damaru*) or cymbal. This figure is well known a that of the great Indian magician Padmasambhava, the "lotus-born," wh introduced a degenerate form of Buddhism into Tibet toward the middl of the eighth century. He conjured and overpowered the native demon but assimilated all of them to the pantheon of Çivaitic gods, which he introduced. He became the founder of a sect known as the Old Church, i distinction from the subsequent Reformed Church, organized by Tsong-kha-pa. The later generations canonized him as the most efficient sain and the second Buddha; and the common people, particularly of Sikki and eastern Tibet, still worship him directly as a god. An immense literature, written in Tibetan and Lepcha, has crystallized around this interesting personage: a bulky biography, teeming with miracles and romanti adventures, and numerous other books have been produced in his hono Only a small fraction of these works has thus far been made accessible i translations: E. Schlagintweit, A. Grünwedel, and the present writer hav contributed several monographs to the subject.

In the work of J. Bacot (Pl. xvi) we find the reproduction of a Mo-s painting representing the same personage. He occupies the center of th picture, being surrounded by four smaller effigies of himself, differing solel in the posture of the hands and feet. Beneath we see a tiger facing a bul the two being separated by a censer from which burning incense flame up and on which six death's heads are figured. On the top is shown Garuda standing in clouds and holding a serpent in its beak and betwee its claws. This picture, accordingly, comprises all essential elements contained on the inner title-page of our Mo-so book. M. Bacot has terme this image Tumbashera, who, according to him, is identical with Sheral i-vo, the mythical founder of the Tibetan Bon sect. As seen also by I. Bacot, however, the Mo-so legends connected with Tumbashera contain estiges of the Buddha legend (as, for instance, the story of his birth from is mother's armpit), and, on the other hand, show a strong resemblance o the tradition of Padmasambhava. The case is such that the whole uddha legend has been plagiarized and transferred to the revered saint admasambhava. The Tibetan people in general do not care much for the ife of Buddha, but they are keenly interested in that of his prophet; and hus the conclusion is justified that also the Mo-so, who are surrounded by ibetan tribes adhering to Padmaism rather than Buddhism, are driven to he same tendency. There is positive evidence forthcoming from the ichols manuscript for the fact that this book deals with a legend taken rom the cycle of Padmasambhava: it is adorned with his portrait on the age preceding the text, and this is a safe criterion to warrant the con-lusion that the text can have only Padmasambhava as its subject. If there-ore his portrait, as assured by M. Bacot, is styled Tumbashera by the Mo-so, his would mean that Tumbashera is the Mo-so designation for Padmasam-hava. Thus the not unimportant result is assured that the Nichols manu-cript represents a chapter or a story from the legendary biography of this aint, a book celebrated all over Tibet and Mongolia.

It is evident also that many other Mo-so manuscripts are nothing but etached chapters from the same work in Mo-so translation. To these elongs the manuscript published by T. de Lacouperie,[15] as proved by the mage of Padmasambhava outlined in the beginning of the first page. Here, n correspondence with numerous Tibetan statues and paintings, he holds n his left hand a skull-bowl supposed to be filled with blood. The title of he same manuscript opens with the well-known Indian design of a lotus-lossom surrounded by leaves, and it is plausible that it may express the rst element of the name of the great saint, *padma*, the "lotus." The echnique and the style of writing of this manuscript are exactly the ame as those of the Nichols book. Also M. Bacot's manuscript[16] mani-estly comes from the same source. It is, however, not complete, or not ompletely illustrated, only four pages being reproduced. The first page, t least, is missing; and the long legend given in translation on pages 18-20 f his work obviously corresponds to far more than four Mo-so pages ith only sixteen short lines.

The specific Buddhist contents of Mo-so literature are strongly borne ut by the Buddhist images and emblems with which the manuscripts are dorned: M. Bonin has encountered in his manuscript a sketch of the uddhist lion, further the traditional picture of the Bodhisatva Avalokiteç-ara, and to his right the design of the conch-shell trumpet, an ancient ymbol of the Buddhist church, the call of which still summons the lamas to their prayer-meetings. Finally, what M. Bonin describes as "the chie of the evil genii, whose robe, head-dress, and boots remind us of those stil worn by the itinerant lamas of Tibet," in my opinion, can be nobody bu Padmasambhava. In the title-page of de Lacouperie's manuscript we note besides the lotus above referred to, the symbol of the so-called *çrīvats* ("lucky knot"), the mystic emblem of the god Vishnu and his adherents

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[15] Beginnings of Writing in Central and Eastern Asia, Pls. i and ii.

[16] Les Mo-so, Pls. xviii and xix.

The second folio of the Nichols manuscript (Fig. 3) opens with a desig of waves common to the art of the East in general. It fulfills a purel ornamental function; likewise the following spiral pattern, which is ver frequently found in the beginning of Tibetan books. The first symbols ar the sun and the moon or month. The striking characteristic of Mo-so writing is the naïve and refreshing realism manifested by the representation of animal pictures. We see many birds on the wing, well-outlined heads o mammals, and even complete beasts like a horse, a stag, and a tiger (Fig. 4) In de Lacouperie's manuscript (Pl. iii, Nos. 101 and 102) we note an el and a yak of surprising naturalness; and M. Bacot (p. 79) gives tw sketches of ravens, which breathe a truly artistic spirit. Of animal heads the goat chewing herbage (*ibid.*, p. 77) and the mule (p. 96) are remarkable. Others are less good, and could hardly be guessed without commentary. The ethnologists interested in the decorative art and picture-writin of primitive man will find here ample and interesting material for stud In the human face we find the front as well as the profile represented i the Nichols manuscript (Fig. 3, line 4). As a rule, the human figure i strongly abridged, characterized only by a circle to which lines are attache marking arms and feet. In the first line of Figure 3 we observe the outline of a house, in the interior of which are standing two persons, the secon being distinguished by a head-dress. This design is many times repeate in our text. M. Bonin had already drawn attention to it, interpreting it a the expression of the idea of the family, man and wife living in their house M. Bacot (p. 91) adopts another explanation, which is, "host who receives master of the house." This being the case, the person honored by the head dress would be the guest. Headgear, presumably a helmet, is met also i connection with warriors brandishing a weapon (Fig. 3, line 2), a symbo which according to Bacot (p. 71) means "to fight." Accordingly, tw stages are notable in Mo-so writing,—full pictures of natural objects an conventionalized shortenings.

But this is not all; we encounter even abstract symbols of geometri character, especially for conveying abstract and verbal notions, and sometimes even denoting living beings. Thus the horse is represented by square #, very much like the Chinese character signifying a "well. A "road" is expressed by a multiplication sign plus a dot in the lowe part ($\underset{\cdot}{\times}$) If a horizontal line is added above ($\underset{\cdot}{\overline{\times}}$), the symbol signifie a "king." It is difficult to discuss the majority of these symbols withou having reference to reproductions of them in the text.

In the writing of the Lo-lo the pictographic characteristics, if they ever existed, have disappeared; and the symbols are composed of decidedly geometric elements. They are pre-eminently ideographic, while Mo-so has a pictographic substratum with a tendency to strive for simplification. There is no similarity or coincidence between Lo-lo and Mo-so characters.[17]

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[17] The best means for the study of Lo-lo writing are the books of Father P. Vial, "De la langue et de l'écriture indigènes au Yun-nan" (Paris, 1890), "Les Lolos" (Shanghai, 1898), and "Dictionnaire français-lolo" (Hongkong, 1909). A Lo-lo manuscript of twenty folios has been reproduced in facsimile by Professor F. Starr of Chicago (in fifty copies).

EUROPE AT TURKEY'S DOOR

By LEON DOMINIAN

[With separate map, Pl. I, facing p. 288]

The dismemberment of Turkey is the goal which Europe has steadily aimed at since the loss of the Holy Land to Christendom. It will also be the last chapter in the long history of Europe's commercial conquest of western Asia. Three causes operate in favor of this partition: the country is rich in natural resources; it is held by a people whose incompetence to convert nature's gifts into use or profit is historically patent; it occupies a commanding situation with reference to the trade of Europe with Asia or Africa. These three points are fundamental in the solution of the Turkish problem.

The European nations most vitally concerned in the dismemberment of the Sultan's dominions are four in number. Great Britain's interest is born of the Empire's relation to Egypt and India. The cause of Russian progress depends on the country's access to warm seaports. Germany, the newcomer on the scene and a land power, is engaged in extending her land area. To her sons Turkey offers an attractive colonization area and at the same time the land route which will render them independent of the sea way passing through Suez to the East. As a colonial power of the first magnitude no less than on account of her millions of Mohammedan subjects, France cannot be disinterested in the fate of the core-lands of Islam.

Turkey is the Asiatic pendant of the intercontinental highway represented in Europe by the Balkan Peninsula. Through Asia Minor it provides a convenient causeway between Asia and Europe. Through Arabia it connects Asia with Africa. Again, through the combined position of Asia Minor and Syria it makes possible continuous land travel from Europe to Africa. Turkey is thus the center of the eastern hemisphere. Mastery of its territory is bound to turn the flow of intercontinental trade into the lap of its holders. The entire history of European conflict over Turkish lands is wrapped around this geographical fact.

Italians were the pioneers of European trade with Turkey after the consolidation of Ottoman power. In this, Genoese and Venetian traders merely followed in the footsteps of their fathers, whose dealings with the Byzantines had been considerable. French merchants were not slow to compete with the Italians. In the fifteenth century English drapers and commissioners begin to appear on the Levantine scene. Germans show signs of activity a hundred years later but confine their operations mainly to the European dominions of the Sultans. From these beginnings to the twentieth-century territorial claims of each of the great powers over Turkey is but a natural economic unfolding.

Turkey's remarkably central position in the eastern hemisphere converts the country into the threshold of Great Britain's Asiatic dominions as well as into the natural land connection between British Africa and British Asia. From India and the British zone in southern Persia as defined by the Anglo-Russian convention of 1907 westward to the sultanate of Egypt, southern Turkey, represented by Lower Mesopotamia and Arabia, is the only stretch of territory in which the British government does not exercise direct control. Even so, the task of consolidating British influence in these two regions of the Turkish Empire is well advanced.

In the economic life of modern Mesopotamia British influence is paramount. About 90 per cent of the trade of Basra and Bagdad is in British hands. Steam navigation on the Euphrates and Tigris, with its attendant privileges of transportation, is a monopoly exercised by Englishmen. This means that all Persian trade which enters or leaves the country through its southern Turkish border must pay toll to British capital. Most important of all, the stupendous task of reclaiming the great twin river valley has fallen to the share of English enterprise.

The area of agricultural lands in Lower Mesopotamia is generally calculated at ten times the total surface of farming land in Egypt. The territory suited for cultivation extends northward from the Persian Gulf roughly to a line drawn from the bend of the Euphrates at Anah to Tekrit on the Tigris. Its eastern boundary is defined by the Zagros and Pusht-i-Koh Mountains. On the west it is limited by the Great Syrian Desert. Thus delimited the region is the great alluvial plain of Mesopotamia. A stretch of land remarkably rich in humus, it only needs to be administered justly and developed properly in order to become highly productive.

In olden days the entire district was one vast field. Its fertility had earned for it the name of granary of the world. Herodotus extols its productivity: " . . . . In grain it is so fruitful as to yield commonly two-hundred fold and, when the production is the greatest, even three-hundred fold. The blade of the wheat plant and barley plant is often four fingers in breadth"[1]. In their present state the once productive lands present the appearance of a desert. The old irrigation ditches are in ruins. Mile upon mile of bare clayey soil or dreary marsh occupies the site formerly given up to grain growing.

The reclamation of this parched country was undertaken in 1908 by British engineers headed by Sir William Willcocks. In the delta region of Mesopotamia, comprising the entire drainage valley extending south of Hit on the Euphrates and of Samara on the Tigris, between twelve and thirteen million acres of first-class irrigation land were to be converted into productive areas. In spite of Turkish opposition the work advanced with sufficient rapidity for the Hindiyeh Barrage to be inaugurated in 1913. After the lapse of twenty centuries a handful of plucky northerners had, notwithstanding well-nigh insurmountable obstacles, put the last touches to the project of drainage regulation begun on the same spot by Alexander the Great, the construction of a new head for the Hindiyeh branch, or Pallocopas, having been that monarch's first public work in Babylonia[2].

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[1] Bk. I, Chap 193. Babylonia's fertility is also noticed by other ancient writers. Cf. footnote in Rawlinson's Herodotus, Vol. I, p. 258, Appleton, New York, 1859.

In the Persian Gulf British influence advanced in great strides during the present century. Within the last ten years the policing of the gulf waters and harbors has been undertaken by English men-of-war. An appreciable curtailment of the trade in fire-arms followed the tracking of gun-runners by British captains. The important towns of the Persian or Arabian coast are virtually British possessions. Bushire[3] on the eastern shore, Koweit on the west are protectorates. The trend of it all is to advance India's western frontier to the line of the Euphrates.

For Great Britain's attitude toward Turkish politics is determined at Delhi rather than London. As ruler of the most numerous political group of Mohammedans in the world, the King of England's residence in his European capital cannot affect India's geographical exigencies, among which the maintenance of a clear road from its shores to the mother island is of prime import. Thus the establishment of a British zone in southern Persia and the attempt to substitute British law in Mesopotamia, where, after all, the Sultan's authority is most precarious in character, merely reveal England's necessity for consolidating her power over the approaches to her great Asiatic colony.

In dealing with Indian geography and the vast body of Mohammedan Hindus attention is necessarily riveted by the question of Arabia. England's stewardship of the peninsular tableland seems inevitable. Not that the huge wastes of burning sand contain resources convertible into profit. But Arabia today, in virtue of its position, represents a wedge of barbarism driven against the civilizing influence exerted by England in Egypt and India. The danger of its proving to be the generating center of revolutionary currents which will involve British colonial policies in destruction is not mythical. Millions of Indian Moslems turn daily in prayer toward the direction of the Kaba'a. A glance at India's history suffices to reveal the extent to which the Gulf of Oman has linked the two peninsulas.

To detach Arabia from a shadowy allegiance to the Sultan of Turkey and bring it within the uplifting sphere of British activity was part of the political program elaborated at Downing Street after the bombardment of Alexandria in 1882. In pursuance of this policy British influence is now markedly felt along Arabia's three coasts. It is firmly planted on the southeast, where Arabia is nearest to India. From Koweit to Mascat every petty potentate exercising an antiquated patriarchal authority has learned

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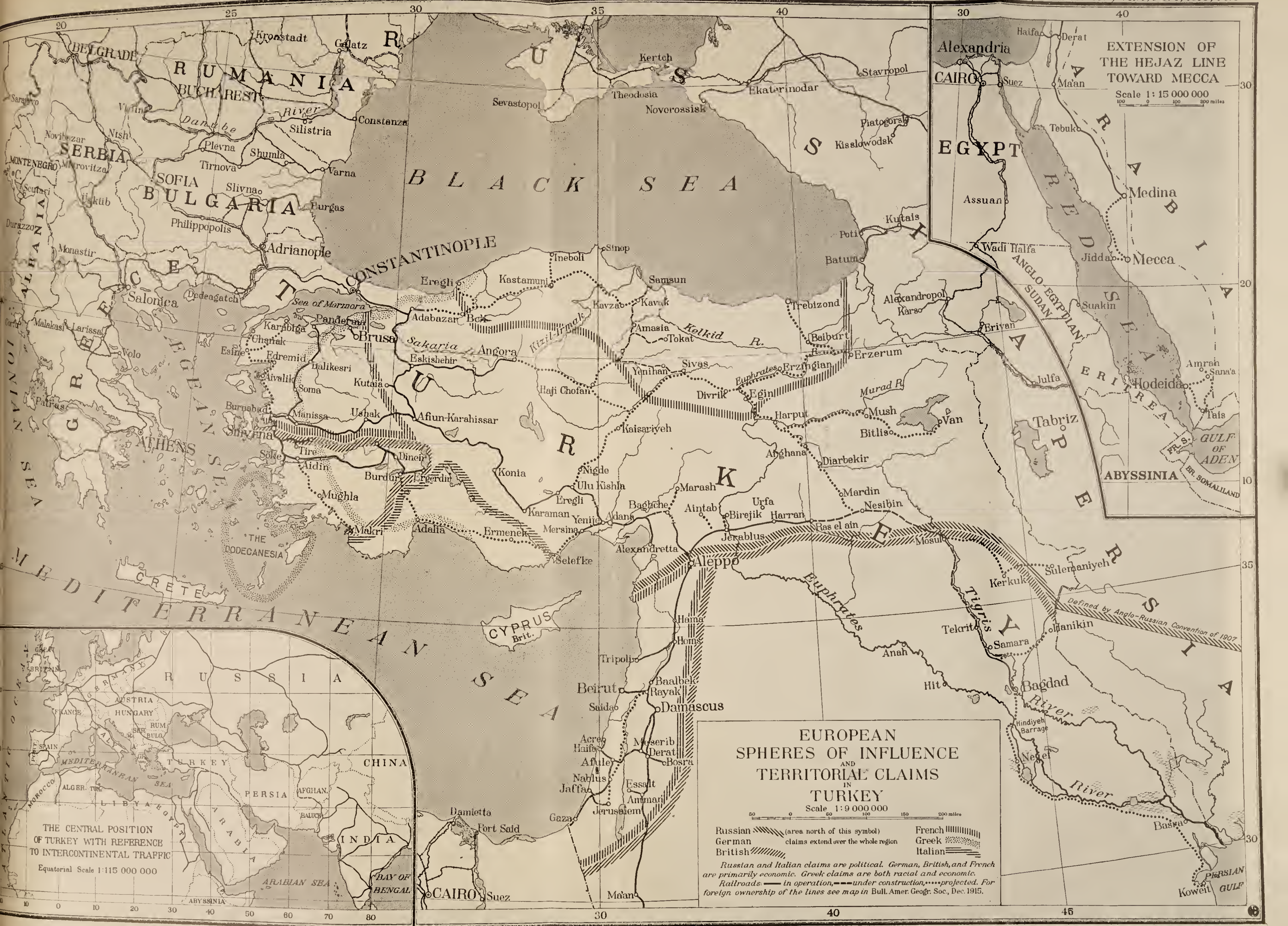
[2] William Willcocks: The Irrigation of Mesopotamia, Spon & Chamberlain, New York, 1911, pp. 13-14.

[3] Bushire, with a population of about 20,000 inhabitants, owes its importance to its being the southern sea terminus of the caravan route which starts at Teheran and passes through Isfahan and Shiraz.

The Geographical Review, Vol. I. No. 4, 1916, Pl. I



EUROPEAN SPHERES OF INFLUENCE AND TERRITORIAL CLAIMS IN TURKEY

Scale 1 : 9 000 000

Russian (area north of this symbol) claims extend over the whole region
German
British
French
Greek
Italian

Russian and Italian claims are political. German, British, and French are primarily economic. Greek claims are both racial and economic.
Railroads: —— in operation, – – – under construction, ····· projected. For foreign ownership of the lines see map in Bull. Amer. Geogr. Soc., Dec. 1915.

EXTENSION OF THE HEJAZ LINE TOWARD MECCA
Scale 1 : 15 000 000

THE CENTRAL POSITION OF TURKEY WITH REFERENCE TO INTERCONTINENTAL TRAFFIC
Equatorial Scale 1 : 115 000 000

to rely on British protection against Turkish encroachments. Aden on the southwest coast is a lone outpost of civilization from which Western ideas radiate outward and occasionally attain the plateau land of Yemen or the niggard wastes of Hadramut. This British seaport is the natural outlet of Yemen. Products of the favored districts around Kataba, as well as between this town and Sana'a, can be transported with greater facility to Aden than by way of the arduous routes which lead to Red Sea harbors.

The question of Arabia involves other considerations. Mecca and Medina, its holy cities, are essentially the religious center of the Islamic world. From the district of their sites Mohammedanism has spread about 4,000 miles in both east and west directions. Among Arabs as well as the majority of Mohammedans outside of Turkey, desire for the restoration of the caliphate at Mecca is strong. The Arabs, especially, consider the sultans as usurpers of the title. Selim I had been the first to adopt it after the conquest of Egypt and Arabia in 1517. The Arabs, however, refuse to recognize the right of any but descendants of the Prophet's family to this supreme post of the Mohammedan ecclesiastical hierarchy. This explains why any ambitious leader who succeeded in circulating the report of his relationship with Mohammed's progeny always secured a following among his co-religionists in Asia or Africa.

As usual, the Arabs have vented this chief grievance of theirs in English ears. They found ready sympathy among British officials no less than among the leaders of their faith in Egypt or India. The complete severance of the Mohammedan caliphate from the Turkish sultanate will, therefore, be a probable result of Franco-British success in the present war. The reëstablishment of the Prophet's family in its hereditary right and capital will have the advantage of providing Islam with a geographical center at the very point of its birth.

The rise of modern German ascendancy in Turkey has constituted the gravest menace to the British project of uniting Egypt to India by a broad band of British territory. German diplomacy has exerted its best efforts during the past generation in the attempt to defeat this design. In overcrowded Germany the need of land for colonization is felt as keenly as the necessity of providing new markets for the country's busy industries. Germany does not contain within its frontier an agricultural area of sufficient extent for the requirements of its fast-growing populations. Against this it has been estimated that with adequate irrigation Asia Minor can turn out a million tons of wheat annually as well as at least two hundred thousand tons of cotton. The basis of Teutonic southeasterly expansion lies in these facts. The immediate aim of German imperialism is to spread through Austria and the Balkan Peninsula into Turkey down to the Gulf of Alexandretta and the shallow waters of the Persian Gulf. But its realization implies the shattering of British projects.

This rivalry in the West Asian field became inevitable from the moment that men of German speech became conscious of the power they ha acquired in 1870 by banding together in a single state. The task o national consolidation once accomplished, the thought of German leaders naturally turned eastwards in the direction in which land extended. Eight years later the prestige acquired by the newborn empire gave it a decisiv voice in the Treaty of Berlin. The first peg in the line of the Teutons southeasterly march was driven then by the revision of Bulgarian frontiers delimited by the Treaty of San Stefano. The Slavic obstacle seeme removed from the Teutons' path and its place filled by the more easily negotiable Turkish obstruction.

From the date of that treaty to the events of the past year, Germany's conduct in Turkey has been determined entirely by the call of the land In 1882 a German military commission undertakes to reorganize the Turkish army. In 1889 the Deutsche Bank—whose directors are the rea leaders of Germany's oversea affairs—is granted a concession for a throug line from Constantinople to Konia. This concession has since been modifie so as to comprise the trans-Anatolian trunk railway which connects th capital with Bagdad. In 1898 the Kaiser visits Damascus in person, ther solemnly to proclaim assurances of his unalterable good-will to the millions of Mohammedans scattered over the surface of the earth. In 1902 the Bagdad line is definitely awarded to a group of capitalists, among whon Germans represent the majority of investors. Henceforth, railroad, mining and irrigation concessions in Turkey seemed to have been reserved exclusively for Germans. The transfer of Turkey's unexploited riches to Germa ownership became almost an accomplished fact.

It was the "Drang nach Osten," a movement directed primarily by th valleys of the Danube and the Morava, and forking out subsequently alon the Vardar and Maritza gaps. To clear this road to Turkey Serbia wa wiped off the map of Europe in the fall of 1915 by Teutonic armies. Fo this, too, had Serbian nationality been split into three separate bodies a the behest of Teutonic diplomatists. Bosnia and Herzegovina, lands Serbian in heart and logic, were administered by Austria, an empire in name like Turkey, but virtually ruled by Prussia since the day of Sadowa Montenegro, of old the refuge of martyred Serbia, had always been prevented by Austria from uniting with its sister state. In truth Serbia la under the bane of a geographical curse. It was always in the way.

This misfortune of position is shared fully by Turkey. Coming at right angles to Germany's southeasterly drive, Russia's steady southwesterl advances in the nineteenth century foreshadowed the conversion of th whole Black Sea and its Bosporus entrance into Russian waters. With th most rugged parts of the Armenian massif in Russian hands since 187 farther expansion through western Armenia into Anatolia cannot be delayed much longer.

The Russian viewpoint deserves every consideration. Russia lies benumbed by the cold of her frozen land. She has had one long winter since the dawn of her nationality. The chief reason why her sons have been aggards in the liberal progress of the past hundred years must be sought in this simple fact of geography. Russia does not need more land or fresh resources. She only seeks the warmth of the sun's rays. Extension of her southern frontiers is forced upon the country, owing to the severity of its climate. Geographically it is Russia rather than Germany who is entitled to "her place under the sun." Individual liberty and democratic institutions will penetrate the country through the portals which genial climate will allow to be maintained wide open.

Russian access to the open sea in the southwest can be secured either by Constantinople or Alexandretta. The Bosporus route is the most advantageous, as the markets for products of the plains of southern Russia are strewn along the coasts of the Mediterranean. But mastery of the Bosporus is of little value to Russia without possession of the Dardanelles strait. The Marmora is but the lobby of the Black Sea. The entire Bosporus-Dardanelles waterway must, therefore, be Russian in order to allow the country to reap the full advantages of attaining ice-free seas. If fifty years ago the question was merely one of political foresight, today it has assumed vital importance, for southwestern Russia's economic development in the present century has made the country absolutely dependent on Balkan and Mediterranean markets.

As an alternative, the harbor of Alexandretta finds favor among Russians. It lies at a distance of only 450 miles from the southern Caucasus frontiers. Moreover, it is part of the ancient land of Armenia, which, sooner or later, is destined to become a Russian province in its entirety. Such an extension of Russian territory to blue water on the Mediterranean has significance in two ways. It would redeem a land that has remained Christian in spite of centuries of Mohammedan yoke, and it might effectively bar German access to the Persian Gulf.

Russian influence in Turkey differs signally from the control exerted by its three western competitors. British, German, or French encroachments on Turkish sovereignty have increased in proportion to the amount of capital expended by each of these countries for the development of Turkish resources. In this respect Russia, which is not a financier's country, stood at a disadvantage. To overcome this condition of inferiority Russians resorted to borrowing from France or England, mainly the former, and invested the funds thus obtained in Turkey. Such transactions have in reality been the means of widening French or British influence in Ottoman lands. The northeastern region of Anatolia, which, owing to its contiguity to Russia, was regarded as a sphere of Russian influence, has lately been looked upon often as a zone of French interests, owing to the participation of French capital in its development. But from a geographical standpoint this alleged French zone is artificial. Its dependence on

Russia cannot be altered as long as its position on the map remains unchanged.

France's natural sphere of interest in Turkey will be found in the Syrian vilayets. Neither is this due to the financing of Syrian public utilities and industries by French capitalists, as is often stated. The relation is the offspring of the Mediterranean, which since the dawn of history has linked the southern French coast to Syrian harbors. Phoenician overseas trade in the first millenium before the Christian era had attained the coasts of Provence and Languedoc. Marseilles, a city born of this intercourse, has maintained commercial relations with Syria uninterruptedly down to the present time.

Franco-Syrian ties were strengthened considerably during the Crusades. The conquest of Syria and Palestine by the Arabs diverted the thoughts of Christendom from the economic importance of these lands to their religious appeal. France, "the eldest daughter of the Church," took the lead in the attempt to wrest the Holy Land from its Mohammedan conquerors,—"*gesta Dei per Francos.*" Many of the petty states founded by noblemen who took part in the Crusades were ruled by Frenchmen. Antioch and Tripoli had French princes, Jerusalem a French king. The title of "Protector of Oriental Christians" conferred by the Papacy on French kings had its origin in the active part played by France in the Crusades.

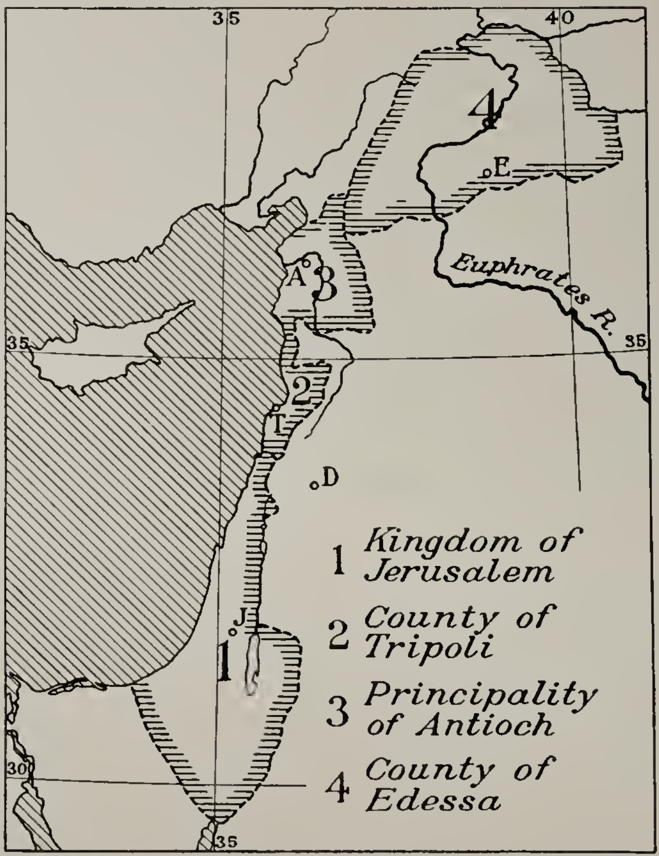


FIG. 1—French states in Syria at the time of the Crusades. Scale, 1:11,500,000. Based on Pl. 68, Historical Atlas, by W. R. Shepherd, Holt, New York, 1911.

France has exercised a dominant intellectual influence in the Levant for at least seven centuries. Turks bestow the appellation of "Frank" on Europeans without discrimination of nationality. Western ideas which have trickled down to Turkish soil are French in character. French schools in Turkey are more numerous than the educational institutions maintained by any other foreign country. The civilizing power of French culture showed its strength by the readiness with which it asserted itself in the midst of uncongenial Turkish thought. France's hold on Turkey thus is of a high moral order. It differs in this respect from the material claims brought forward by the other European powers.

At the same time through the investments of French capitalists a well-efined zone of French interests has been created in Syria. Excepting the ejaz line, every railroad in the province has been financed in France. he silk factories of the Lebanon, around which the whole industrial life f Syria clusters, have been started by French citizens. Their annual roduct, usually estimated at half a million kilograms of silk, is exported o France. Syrian silk farmers in need of funds for the annual purchase f cocoons raise their loans exclusively among the banking houses of Lyons. ithout, however, confining French interests to Syria alone, it is enough o state that fully one-half of the amount of one billion dollars representing urkey's official debt to Europe has been advanced by French financial nstitutions.

It is difficult to assign a place to Italy in the array of European claimnts to Turkish territory. The trade between Italian and Turkish seaports as lost the relative importance it had acquired in medieval times. Italian retensions to Adalia Bay and its rearland are of quite recent date and the esult of conquests in Libya. But beyond vaguely formulated promises or railway concessions from the Turkish government no ties bind the egion to Italy. The country, however, created its own sphere of interest omewhat unintentionally by the occupation of the islands of the Dodeanesia. It outpaced by this act every other European country taking art in the race for a share of Turkey.

The group of islands lying off the southwestern coast of Anatolia is ow held by Italy in virtue of stipulations covenanted with Turkey at the reaty of Lausanne in 1912. According to the terms agreed upon, Italy as to occupy the islands in guarantee of Turkish good faith pledged to revent anti-Italian agitation in Libya. Upon complete pacification of the atest territorial addition to Italy's African domain, the political fate of he islands was to be determined jointly by the six Great European Powers.

The islands, between twelve and fifteen in number, are peopled excluively by Greeks. Hellenic customs, language, and religion have survived pon each in spite of centuries of Turkish rule. Italian sovereignty, howver benevolent or tending to promote the welfare of the islanders, is disiked equally at Patmos, Leros, Cos, or Rhodes. The remaining islands re relatively unimportant, sometimes consisting of mere uninhabited ocks emerging to a height of two or three hundred feet above the Aegean. ut, to the smallest inhabited islet, annexation to Greece is keenly desired. he Italians were hailed as liberators from the Turkish oppression by the ardy fishermen, who labored under the impression that their island homes ad been rescued in order to be annexed to Greece. Their disappointment as expressed in mass meetings at Patmos and Cos in 1913.

Racial and historical considerations add their burden of proof to the inguistic claims advanced by the Greeks in Greece and the Dodecanesia. s sailors the islanders have maintained to this day classical traditions of

Hellenic maritime activity in the region. The islands in fact constitut lands of unredeemed nationality whose natives are without a single exception of the same race as their kinsmen on the mainland.

This fact, combined with the distribution of a numerically preponderant Greek element along the western coast of Anatolia, converts the Aegea into a truly Greek sea. Structurally the coastlands encircling this bod of water are identical. In the east as in the west they constitute the upwarped margin of a subsided area. Identity of land and peoples has give rise to the Greek claims on western Turkey. Greece, therefore, stands i line with the other European nations expecting to share in the inheritanc of the moribund Turkish state.

The claim is historical no less than economic. The association of th Aegean region with centuries of Hellenism and fully one millenium o Byzantinism is by no means severed in modern days. For the second tim in its glorious history, the ancient city of Athens has become the social political, and intellectual center of the Greek world. In one and the sam prospect the Greek capital can point with pride to the Hellenic splendo emanating from Anatolian ruins and to her modern sons achieving dail economic victories over the Turk in his own land.

In this spectacle of nations lying athwart each other's path the clu to the adequate settlement of the Turkish problem may be found. Turke is above all else a roadway—a bridgeland. The fate of the country is boun to this fact. It cannot avoid it. As soon as this point of practical geography is recognized it will be easy to provide international legislation i which the claims of interested powers will be harmonized. But no solutio of the political problem involved can ever be attained without full consideration of its geographical aspects. Omission of the available data o science implies neglect of the realities of the case. It will leave the Easter question in the hopeless tangle in which it has labored for the past hundre years.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

New Fellows of the Society; Monthly Meeting of February. A regular monthly meeting of the Society was held at the Engineering Societies' Building, No. 29 West Thirty-ninth Street, on Tuesday evening, February 29, 1916. President Greenough presented by name the following fifteen persons, recommended by the Council for election as Fellows, and after a vote they were declared elected:

E. C. Andrews
J. P. Ault
Henry A. Christian
William W. Clendenin
Countess Eila Festetics
William M. Gregory
John W. Harshberger
George A. Mulloy
Howard Notman
Charles W. Obermaier
John M. Phillips
George Shiras, 3rd
Howard E. Simpson
J. W. Stromberg
Thomas M. Weed

Dr. Frederic Poole then addressed the Society on "China, Ancient and Modern."

At an extra inter-monthly meeting on January 11 Mr. Frederick I. Monsen, F.R.G.S., spoke on "Turbulent Mexico."

NORTH AMERICA

The Growth of Connecticut as a Manufacturing State. The industrial character of Connecticut appears from the figures in the U. S. Census Report on Manufactures for 900-1905. The state accounted for 80.7 per cent of the rolled brass and copper, 72.2 per cent of the ammunition, 69.4 per cent of the clocks, 66.9 per cent of the plated ware, 1.6 per cent of the brass ware, and 46.9 per cent of the hardware produced in the entire country. Germs of this development existed in 1818—a date for which reliable information is attainable—and indeed earlier, for industrial change was gradual. The Revolution had wrought no startling metamorphosis ("An Introduction to the History of Connecticut as a Manufacturing State," by Grace P. Fuller, *Smith College Studies in History,* Vol. I, No. 1, 1915). The state still imported little raw material, and its exports were still confined to extractive products from the limits of the tidewater area. The five incorporated towns owed a large share of their prominence to commerce, a fact particularly true of New Haven, with its considerable foreign commerce, and New Bedford in the heyday of its whaling industry. This period of the early nineteenth century marked the first stage of emergence from the old-time handicraft manufacturing. The back-country towns indeed continued dependent on their own industry for all kinds of manufactured goods. Contemporary records list 38 such rural towns—about half the actual number—as having only the slightest contact with the outside world. Towns with a genuine outside market numbered 45. In these, business was for the most part conducted on the social-order method excepting only in the two capitalized industries of straw-braiding and shoe-making, where domestic work predominated. At this epoch the state was supporting a maximum population for its agricultural resources, and the major part of its increase emigrated westwards.

In 1845—another date for which satisfactory evidence is forthcoming—the state was still primarily agricultural. Sixty per cent of the population lived in distinctly agricultural towns (i. e. townships) of under 3,000, and many of the dwellers in the manufacturing towns were dependent on agriculture for a livelihood. But the manufacturing possibilities of the state were now more apparent. Although the supply of raw material was poor, means of communication were good for the time. Already by 845 the east-to-west waterway of Long Island Sound was connected with the Western (Boston and Albany) Railroad by three cross-country lines. Water-power resources were exceptional, and labor, though limited in quantity, was of superior quality. Scarcity of the latter played a significant part in deciding the particular form of manufacturing evolution. Unlike the English development, manufacturing in New England passed directly from the handicraft stage to the factory without the intermediate domestic system. The agricultural expansion of the West created a new attitude towards labor in the East, bestowing on it value and dignity. The mid-century period also pointed out the destined specialization of Connecticut manufacturing. Notable early industries disappeared—the iron manufacture of Litchfield, the flour-milling of the southwest shore, the distilling of the agricultural section above Hartford. Textiles made little progress, but light metal wares increased. The manufacture exemplified by "Yankee" notions, clocks, and tinware, formerly peddled industriously—almost notoriously—by Connecticut sons in the South, was soon to enter on the grand stage of production and to make the state primarily manufacturing. The change may be said to have been reached between 1870 and 1880. In 1870 the population was almost twice that of 1820, when agriculture was supporting the maximum density for the time, and in 1880 more than half the people had come to live under urban conditions.

Lundbreck, Alberta: A Mining Venture. Lundbreck is a foothills village west of Lethbridge, Alberta. Much of the originally forested Crows Nest Valley, in which the village is located, has been repeatedly burnt over and the forest replaced by prairie,—excellent grazing land and favored moreover by the climatic advantage of well-developed chinook winds in winter. The withdrawal of the native Indians to reservations in the early eighties cleared the way for a large-scale grazing industry. Great ranges existed until the appearance of the railroad and the homesteader in 1897. Six years later a station was established on the site of Lundbreck. Thus was afforded facility for shipping the coal known to occur at that point. Two mining companies commenced operations; a combination of their names furnished the designation for the town that rapidly sprang into existence. Steady progress was made until 1907, when work at the mines became spasmodic. During the summer the place was practically deserted: in the fall of 190 one company, employing some fifty men, was shipping its coal to Spokane, the other remained closed for the greater part of the year. The decline continued until 1911, when there was a revival of business—the daily output increased from 30 to 450 tons, 150 men were employed, and the town population rose to 300. These non-union mines had been able to profit by a general strike of the West Canadian coal fields; but the boom was necessarily short-lived, and a decline set in once more. In 1914 coal was extracted for local consumption only. The miners—chiefly English, Scotch, Welsh, and Nova Scotians—nomadic like all their kin in the regions of the prospector, dispersed to other fields, except a few who took up homesteads in the vicinity. These with the earlier settlers constitute the support of the present village of some fifty souls. Causes of the decline are to be found in difficulties inherent in the resource itself, in the lack of a home market and competition with more favored areas, and in correlated mismanagement of the mining operations. The seams are intensely folded, broken by small faults and inclined to "pinch out." The mines need careful timbering, and timber is only to be procured at a distance. West of the Lundbreck area are the highly bituminous or anthracitic Kootenay coals: east is the great field of the Belly River formation.

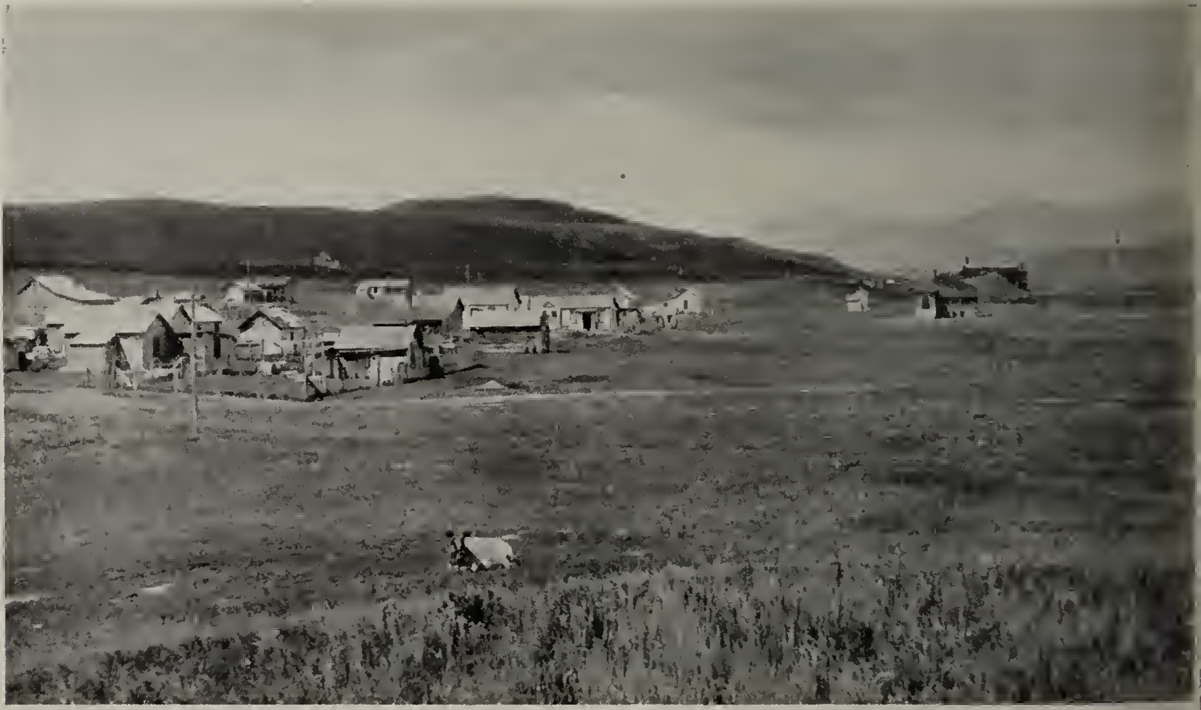


FIG. 1—The coal-mining "boom" town of Lundbreck, Alberta, in its present decline. (Photo from Canadian Geological Survey.)

Under such conditions it is not surprising that Lundbreck showed the evanescent features more characteristic of the mining of the precious metals. (Compare with the item below on "The Rise and Fall of the City of Gladstone.") JAMES S. STEWART.

The Rise and Fall of the City of Gladstone. Under this title the ephemeral life of a type of western city is described by C. C. Baker in the 1914 issue of the *Annual Publications of the Historical Society of Southern California* (Vol. 9, Part 3, pp. 188-194). The adventurous spirit which leads settlers into sparsely populated districts between the Rockies and the Pacific does not stop at creating cities whenever there appears to be opportunity for making boom sales of house lots. Gladstone owes its spectacular career to the great boom which swept over California in 1887. Its promoters saw in the town a future rival to Los Angeles.

But a city is a natural product. The causes of its existence are generally economic. As a rule it is a station on an avenue of trade. Its prosperity also depends on the natural resources of the environing country. Gladstone could not boast of special advantages in this respect. It was an unnecessary artificial creation—a venture launched, it may be suspected, for purposes of speculation rather than with other aims. Many mining settlements of the Gladstone type had a similar fate. Abandoned shanties mark their site in the deserts of California and Nevada, in the mountains of northern Idaho, and along the deep valleys of the Interior Plateau of British Columbia. (See also the preceding item on Lundbreck, Alberta.)

Another excellent example of the "ghost" cities of the West is described in an article that appeared under this title in the *Saturday Evening Post* (Philadelphia, Sept. 4, 1915). Before the great slump in the price of silver following demonetization, Eureka, Nevada, boasted a population little short—it is said—of five figures. According to the last Federal census the population of the precinct was only 661.

Winter Steamship Connection between Prince Edward Island and the Mainland. The old limits to the navigation of shores ice-bound in winter are being slowly pushed back. The success of the large British ice-breakers in extending the Archangel shipping season has attracted much attention. Now from Prince Edward Island comes the report that for the first time in the history of the island communication with the mainland has continued daily without interruption throughout the winter (*Commerce Reports*, March 13, 1916). This success has been achieved by the new car-ferry steamer acquired for the Charlottetown-Pictou (N. S.) service. Heretofore the heavy ice of Northumberland Strait has always constituted an impediment, whose effect showed itself n the diminished returns for freight and passenger traffic during the winter. During the months of January and February of the current year shipments to the United States were valued at $47,640, whereas for the corresponding period of the preceding year, with broken communications, they were only $16,329.

Distribution of Thunderstorms in the United States. The geographic distribuion of thunderstorms is a matter of great meteorological and climatological interest—meteorological, because of the need of this information in our study of the origin and mechanics of these phenomena; climatological, because of the many relations which exist between thunderstorms and the life of man. Our crops, our safety, our water supply, our outdoor activities, are all measurably affected by thunderstorms and by their accompanyng lightning and hail. Charts of thunderstorm distribution have been published in Professor Alfred J. Henry's "Loss of Life in the United States by Lightning" (*U. S. Weather Bur. Bull. No. 30*, 1901) and in the same writer's "Climatology of the United States" (*Bull. Q*, 1906). There has always, and naturally, been some difficulty in definng "a thunderstorm" for purposes of record and of charting. Thunderstorms vary in ntensity from those of great violence, with well-defined characteristics, to those which mount to no more than a peal or two of thunder, perhaps without any precipitation. The official instructions for the observation of thunderstorms have varied from time to ime during the period of our Government meteorological service, and this fact, together with the inevitable difficulty of accurate and specific observation, have made our records ather unsatisfactory.

What are likely, for some time to come, to be the standard charts of thunderstorm istribution for the United States have been prepared by Mr. W. H. Alexander and ublished in a recent number of the *Monthly Weather Review* (Vol. 43, 1915, No. 7). The period covered is 1904 to 1913, inclusive, during which time the systematic observaion of thunderstorms, according to a uniform scheme, has been on a more satisfactory asis than in earlier years. Mr. Alexander has charted the total numbers of thundertorms for each month and for the year during the ten-year period above noted. By ividing the numbers shown on the charts by 10 the average annual number is easily etermined.

The chart of most general interest is that of the annual frequency. No part of th United States is entirely free of thunderstorms. There are two centers of greate activity, one in Florida and the other in northern New Mexico. Around Tampa, Fla 944 thunderstorms have been recorded in the ten years, and in the vicinity of Santa F N. Mex., the number is 710. Our previous charts showed the center of maximu frequency over Florida, but did not indicate any marked second center over New Mexic The new chart, further, does not bring out a center of considerable thunderstor frequency over the lower Missouri valley, as did the earlier charts, although the gener bending of the lines of equal annual 10-year numbers on Mr. Alexander's chart, nort ward and northwestward up the Mississippi and Missouri valleys, emphasizes the favo able conditions of thunderstorm occurrence over that region. R. DeC. Ward.

A New Isogonic Chart of the United States. *Special Publication No. 33* of th U. S. Coast and Geodetic Survey contains a map showing lines of equal magnetic declin tion and of equal annual change in the United States for 1915. This map is a revise edition of the isogonic chart published in 1910 in *Special Publication No. 9.* Since tha time the results of observations at more than one thousand new stations and two hundre repeat stations in the United States and adjacent parts of Canada have become availabl These data are being collected in the course of operations undertaken since 1899 with th object of making a magnetic survey of the United States.

The map shows that the line of no change of declination runs from the Lake of th Woods through St. Paul, Minn., Springfield, Ill., to Key West, Fla. For places east o this line the north end of the compass needle is moving to the westward, and to the east ward for places west of that line, at annual rates indicated on the map. The agonic lin or line of no declination, for 1915 lies somewhat to the east and passes through th lower end of Lake Michigan, western Ohio, and southwestern South Carolina, leaving th land at Beaufort and continuing through Nassau in the Bahamas and the eastern tip o Cuba. The disturbing influence of the Appalachians is evident from the irregularit of the line in that region.

The Northern Hardwood Forest of Eastern North America. The norther hardwood forest, occupying approximately 50,000,000 acres mainly in the basin of t Great Lakes and the St. Lawrence, with a southern offshoot on the Appalachians, cente around the area of maximum exploitation of the white pine. Its limits are almost exactl defined by the range of the yellow birch, with the sugar maple the most characteristi hardwood tree. The northern is further distinguished from the southern hardwood fore by the presence of spruce and hemlock, the absence of yellow poplar, red gum, an sycamore, and also by relative simplicity of composition. It has only 21 hardwoo species against the 95 of the southern. The broad limits of the forest are determined t the west by the factor of decreasing rainfall; to the north and south by temperatur Within the region the optimum temperatures—a value more important than extremes— are to be found at elevations varying with the latitude from 500 feet (minimum above sea level in northern New England to 3,500 feet (minimum) in South Carolin Soil selection is seen most clearly in the Great Lakes region, where glacial clays ar particularly favorable. Yet lighter, sandy soils are not avoided where there is exposur to moist winds, as in the southwestern corner of Michigan. On dry, sandy plains th type runs to one extreme—oak, hickory, and chestnut. The other extreme, the swam lands with black ash, red and silver maple, and willow, is more distinctly southern an might be considered as an outlier of the southern type ("The Northern Hardwoo Forest: Its Composition, Growth, and Management" by E. H. Frothingham, *U. S. Dep of Agric. Bull. No. 285,* 1915). The forest has been one of the factors of profoun importance in the progress of North American civilization. First barrier, then resourc something of the magnitude of its influence may be gleaned by simply noting the exten of forest removed. Originally the forest cover stretched practically unbroken fro Maine to eastern Minnesota: now, including second growth, the forested surface i reduced to 60 per cent in New England, 43 per cent in Michigan and Wisconsin, and 3 per cent in New York and Pennsylvania. The greatest reduction has, of course, bee in the soft woods. They were the exploiter's magnet. The hardwoods were principall removed for agricultural clearings, until the decline in softwood production gave the an increasingly important market. Since 1899 the cut of hardwood has also declined though not so rapidly as that of the softwoods. Figures for 1912 show a relativ increase in the proportion of the former of 28 per cent for Michigan, 24 per cent fo Vermont, and 22 per cent for New York. Small increases are indicative of states wher conifers still remain comparatively important—spruce in Maine, white pine in Minnesota and hemlock in Pennsylvania.

The Danish West Indies. Location is a geographic factor of prime importance n the case of two of the West Indian islands, Curaçao and St. Thomas. As a refuge nd revolutionary base Curaçao has figured in Venezuelan politics from the outbreak of he Wars of Independence. Political interest in St. Thomas, more spasmodic, is again o the fore with the revival of the half-century old project of the purchase of the anish West Indies by the United States. The largest island of the group, Santa Cruz St. Croix), is fertile and well adapted for its old business of sugar cultivation and its ew one of cotton growing; but this is a matter of little weight beside St. Thomas' uperb harbor and situation as the ''Gibraltar of the American Mediterranean.'' lways a free port, open to the shipping of all nations, Charlotte Amalia has enjoyed ts periods of prosperity. In the eighteenth century this neutral port gained its reputa-ion as a collecting and distributing center for the islands. In the American Civil War t proved, like Nassau in the Bahamas, one of the most accessible West Indian ports or the blockade runners of the Confederacy. Decline came with the replacement of sail hipping by steam. Economic decline has been followed by decrease in population, to hich the high infant mortality due to bad sanitation—said to be no less than 63.5 per ent (*The Independent,* March 6, 1916)—is a contributory and correlated cause. For he three islands of the group the population in round numbers was 43,000 in 1835, 0,000 in 1901, and 24,000 in 1914. The Danish West Indies thus present an absolute ontrast to Porto Rico, where improved economic and hygienic conditions were followed y a rapid expansion of population (cf. the article on ''Overcrowded Porto Rico'' in he March *Review,* pp. 211-212). The measure of importance still retained by St. homas is due to its advantages as a coaling station (*Diplomatic and Consular Repts.,* nn. Series, No. 5485, London, 1915). On the work incident to this depends the greater art of its 10,000 inhabitants, negroes from the British West Indian islands.

The West Indian Hurricane of August, 1915. Our records of West Indian hur-icanes go back as far as the time of Columbus (1493). In all, nearly five hundred of hese storms have now found their place in this long history. The origin of tropical yclones is still open to debate. But their prognostics, characteristics, usual belts, and estructiveness are well known. Although all more or less alike, a careful study shows hat each hurricane has individuality. Each one is therefore worth accurate charting nd close scrutiny. The Gulf hurricane of August last, whose current history was fully eported in the daily papers, has been studied by Professor H. C. Frankenfield of the . S. Weather Bureau (*Monthly Weather Rev.,* 1915, pp. 405-412). The storm center eems to have reached the west of Texas, near San Luis Pass, about 26 miles southwest f Galveston, about 1 A. M., August 17, shortly after which time a slow recurve to the orth and northeast began. The lowest barometer reading at Galveston was 28.63 inches, ith a maximum wind velocity of 93 miles an hour. At Velasco, Tex., the barometer ell to 28.06 inches, the lowest recorded during this storm. This is, of course, not by ny means unprecedented. The diameter of the ''eye'' was about five miles. The loss f crops, buildings, railroads, shipping, and live stock was estimated at close to 50,000,000. Crops in fully one-half of Texas suffered severely. Damage by high winds as reported as far as the lower Ohio valley, especially over eastern Missouri. The reatest damage was, however, due to the floods resulting from the torrential rains hich extended from Texas northeastward to New York. At Galveston, the famous 'sea wall'' (17 feet above mean low tide) which was built after the ''Galveston torm'' of September, 1900, to protect the city from flood damage caused by the Gulf aters, stood firmly and doubtless served effectively to prevent far more serious losses f life and property than actually occurred. Comparing the 1915 hurricane with that of 900 it appears that the two storm paths were very similar. The wind velocities in hese storms were not very different, and the effects were much the same, except as modi-ed by artificial conditions in the vicinity of Galveston. Several illustrations of the amage done at Galveston and Houston and a number of special weather maps accom-any Professor Frankenfield's paper.

R. DeC. Ward.

SOUTH AMERICA

Fur Industry of South America. Chinchilla, nutria, jaguar, and puma are usually ited as the chief South American furs of commerce. To these may be added vicuña, fox, nd seal. With the exception of jaguar and puma the fur-bearing animals of the land are imited to the highlands of Peru and Bolivia and the parts of Chile cool or temperate on ccount of their latitude or elevation. Trade in the furs of the cat tribe is exceedingly imited. Natives of the Chaco (Paraguay) are described as bartering these skins on he banks of the Paraguay River. In commerce the furs are likely be known as 'South American lion.''

Chinchilla is the distinctive and valuable South American fur. It was first introduced on the European market in the early nineteenth century and has lately gaine in popularity to such an extent as to seriously threaten exhaustion of supply; price have become correspondingly elevated. In 1901, Chile exported 385,740 skins value at $805,391; in 1910, 50,000 valued at $1,000,000; in 1911, 37,000 valued at $750,00 (Chilean currency). The animal is hunted in the Bolivian and North Chilean Cordillera From the provinces of Antofagasta and Arica, where it was formerly plentiful, it ha totally disappeared; Vallenar and the north of Coquimbo are now the chief Chilean producing districts, and here it is reported that skins of a type valued at $10 in 1908 fetched $20 in 1910 and $30 in 1912. In some of the wilder and more inaccessible parts of Bolivia the chinchilla still exists in some numbers. The animal is hunted by the Indians, who commonly employ for the purpose dogs or ferrets which are traine to enter the burrows. The method entails destruction of the young but is a little les barbarous than the use of the dynamite or fire methods that also obtain. A *chinchillero* is endowed with unlimited patience; he will spend two, three or more months in securing as many specimens; however, some of the Bolivian hunters have made fortunes o £8,000 (P. Walle, Bolivia, pp. 370-371, Fisher Unwin, London, 1914).

During the last few years there has been a considerable agitation in Chile fo chinchilla conservation. Its advocates urge prohibition for a short term of years, unti this fecund animal shall have replenished the supply, and the adoption of such protective measures as a closed season during the breeding time and the exclusive use of prope traps for hunting (see Carlos Sage: ''El esterminio de la chinchilla,'' *Bol. de Bosques Pesca i Caza,* July, 1912, p. 27, Santiago de Chile. This periodical, which dealt chiefly with the conservation of the resources named in the title was published from 1912 to 1914, when it was suppressed by the Chilean government.) The sovereign method of conservation, however, is breeding. Some attempt at this has been made in Vallenar On the farm of Sir John Murray the original stock of 500 chinchillas rapidly increased to 2,000 (see illustration in article by Isaiah Bowman, ''Results of an Expedition to the Central Andes,'' *Bull. Amer. Geogr. Soc.,* Vol. 46, 1914, p. 169). In captivity the chinchilla is a little smaller, but the fur is compensatingly fine and thick.

The chinchilla has been crossed with a member of the same family, the vizcacha producing a fur which, though less valuable, has found a ready market as a substitute for the declining supply of chinchilla. Vizcacha itself is exported. In 1900 the trade wa unknown; in 1911, over 250,000 skins valued at $17,667 were sent from Chile.

Formerly the great annual fairs of the Bolivian tableland were the collecting ground for the furs: but their importance has declined of late. Challapata, on the Oruro Antofagasta railroad, 70 miles from the former city, had the best known fair and is said still to be the best place for buying chinchilla. Export, chiefly to Europe, is made through the ports of northern Chile from Coquimbo to Arica. Coquimbo and Antofagasta are the two principal ports of shipment. In 1913 chinchilla skins to the value of $14,034 (American) were sent to the United States from the consular district of Valparaiso (including Coquimbo), but no figures are given for 1914. In the latter year Iquique dispatched $3,893 worth to the same destination (*Suppl. to Commerce Repts.* Ann. Series, No. 41a, 1915, Washington).

Of the members of the ''South American sheep'' family—llama, alpaca, guanaco vicuña—only the last has value as an export skin. Guanaco skins are largely used by the Patagonian natives; llama and alpaca are valued for their wools. The natives have engaged in communal hunts from time immemorial; these are described in much of the South American travel literature. A short article by Charles W. Furlong entitled ''Hunting the Guanaco'' appeared in the *Outing Magazine* for October, 1912. Today on the European market vicuña skins, used as rugs, fetch £4 or £5 apiece.

The nutria (*coypu*), similar to the American musk rat, is hunted along the watercourses of southern Chile. With otter and fox it is chiefly exported from the center and port of the South Chilean fur trade, Punta Arenas. The ''Censo Jeneral del Territorio de Magallanes,'' Punta Arenas, 1908, gives some export statistics. Prohibitions of seal hunting in northern waters have turned attention to the inferior seals of the southern seas. Seals are common along the Peruvo-Chilean and Argentine coasts, but the better species is found south of 46° S. Such skins conserved in slat are exported to England at the mean price of £5 each. The principal Chilean company, Compañia Austral de Pesqueria, has its headquarters in Punta Arenas. Conservation is being urged for the seal as well as the chinchilla. In 1901, 3,306 fine seal skins valued at $35,899 (Chilean) were exported from Chile; in 1911, 2,612 valued at $67,912. Other statistics are given in ''Estadística Comercial de la República de Chile,'' Santiago de Chile, 1914. Uruguay also has interests in seal fishing. (See also article ''Furs in the Americas,'' *Bull. Pan American Union,* Vol. 28, No. 2, February, 1914.)

Argentine Labor and the War. It is many years since Alberdi said "to govern is to people," and yet today Argentina has a population of under seven to the square mile. The Government, it is true, encourages immigration and by new colonization laws framed on the homestead plan is endeavoring to fix the immigrant to the soil. At present fully 25 per cent of the total immigration is of the *golondrina* type, upon which the country depends very largely for its harvesting. It has been estimated that at the end of the season the average harvester is able to return to his home in southern Europe with $150 in his pocket. This source of labor has been hard hit by the war (*The South American Journal*, Dec. 18, 1915). Only 26,800 immigrants had arrived by the end of October, 1915, and 96,000 persons, including 34,000 reservists and volunteers, had left the country. To lighten the harvesting difficulty the railroad companies have been requested to reduce their charges for transportation of labor destined for the purpose.

The Argentine Meteorological Service. The Argentine Meteorological Service was established in 1872, under the direction of Dr. B. A. Gould, the founder of the Astronomical Observatory at Córdoba. Doctor Gould continued in charge of the Service until towards the end of 1884, when he left Argentina. He had established 52 meteorological stations; had secured the publication of four volumes containing discussions of the observations; had constructed isothermal charts whose essentials have not been greatly altered by any later work; and had collected rainfall data which, for the first time, showed the distribution of precipitation over the southern portion of South America. In 1885, Mr. Walter G. Davis, a native of Vermont, succeeded Doctor Gould and continued at the head of the Service until his retirement last year, after thirty years of active work in that position. Under Mr. Davis' able direction, the Argentine Meteorological Service attained a position in the very front rank of all the government meteorological services of the world. The publications have been numerous, and all of them of recognized high standard. Among the many activities of this Service may be mentioned the taking over, in 1904, of the meteorological and magnetic station at Laurie Island, in the South Orkneys, which had been established in the previous year by the Scottish Antarctic Expedition. Under conditions of extreme loneliness and of great hardship, the observers at this remote outpost have maintained their records faithfully for eleven years—a series of observations of the greatest importance in the study of world meteorology. (See the note on the "Climate of the South Orkneys," under "Polar," below.)

With the Laurie Island station (lat. 60°43′ S.), the Argentine Meteorological Service extends over nearly 40° of latitude. It has 42 first class, 162 second class, 12 third class, and 1,930 fourth class stations. The 8 A. M. and 8 P. M. observations from 190 stations are used in constructing the daily weather map, besides the rainfall record from about 1,350 rainfall stations.

A recent publication of the Argentine Meteorological Service (1914) gives, in Spanish and in English, the history and organization of the Service, and includes a concise and useful summary of the results, by climatic provinces; a discussion of the atmospheric circulation and the weather of Argentina, by H. H. Clayton, now Chief of the Department of Forecasts, formerly at Blue Hill Observatory, and an excellent series of climatic charts, which give all the essentials of Argentine climatology. This publication is an inspiring record of splendid work, well planned, thoroughly organized, and ably carried out. Mr. Davis, the retiring Director, who is now in the United States, has well earned the rest and the relief from the heavy responsibilities which, as head of one of the world's best meteorological services, he has carried for thirty years.

R. DEC. WARD.

ASIA

Reforestation in China. China is awakening to the necessity of protecting her treeless hills and plains. The forest situation in the country is well-nigh hopeless. Since trees have vanished floods have become common. To a population sunk in deepest poverty the only form of fuel available is timber cut within proximity of the home. The climate of the greater part of the country is such that fuel is as necessary for warmth as for cooking. The needed forest products must be imported, and this the Chinaman cannot afford. He is therefore beginning to realize that his neglect of his country's forests accounts largely for his low standard of living and that with an abundant supply of lumber and timber his comfort, health, and earning capacity would be increased.

W. F. Sherfesee, Director of Forestry in the Philippine Islands, contributes to the November number of *American Forestry* (Vol. 21, 1915, pp. 1033-1040) an account of the action undertaken by a number of influential Chinese and by the University o Nanking to carry on extensive work in reforestation. A school of forestry has bee added to this institution and a beginning made in actual tree planting on the slopes o Purple Mountain nearby.

There is reason to believe that forest planting on a large scale on the idle lands o China would be highly profitable. Large tracts of excellent land are now lying wast with an overcrowded and desperately poor population in their vicinity. Soil an climate are eminently fitted for the purpose. Labor is abundant and cheap. It can b made efficient by proper instruction. In comparison with situations in which reforestation has been successfully carried out in the United States, the conditions in China ar extremely favorable.

Most of the Chinese idle lands belong to the state. A portion of their total area i well adapted to agricultural and fruit-growing purposes. The orchards occasionall met with show that it is possible to make these lands yield satisfactory results. Bu by far the largest part of unused lands is suited only to the production of fuel an timber. Steps should therefore be taken to encourage the owners of private land t plant profitable trees and get public lands into private ownership for the same purpose. The Chinese government cannot shoulder the financial burden of extensiv reforestation. But much can be accomplished by private enterprise. It is the citize himself who must feel sufficiently interested in the welfare of his country to undertak seed distribution and the establishment of nurseries.

The reforestation undertaken on Purple Mountain affords an excellent example o what can be accomplished by means of a little care and industry. The work wa originally undertaken to relieve a famine-stricken community. Many of the destitut members were assigned to the task of building roads around the mountain. The ric land at its base was turned into a crop-yielding area, and the bare slopes were plante with young trees. The assistance thus rendered to countless Chinese who were homeles and destitute had the twofold advantage of meeting their immediate necessities and o providing some of them with a permanent livelihood. Many families now enjoy a comfortable home on the land made productive by tree planting.

Irrigation in India. The contrasts and resemblances in methods and results irrigation in India and the United States are of peculiar interest at the present tim when there is a temporary lull in development. The renewal of activity in our ar West, which must come about in due time, should be accompanied by a better appreci tion of some of the lessons taught by Indian experience.

A recent short article in the *Geographical Teacher* (No. 42, Vol. 8, 1915, Part 2, p 118-124) points out the dependence of irrigation development in India upon geographi and topographic conditions and shows how from the beginnings of the old primitiv wells watering a few acres there has been a growth, in the northern plains, of th net-work of canals and, in the southern plateau, a multiplication of the many reservoi and small works, each type being adapted to its topography.

The reservoirs—some of great antiquity—are almost innumerable. They consis essentially of earthen tanks formed by building a series of banks around a depressio in the ground or by erecting an obstruction to the outlet of a small valley. The vary in size from a few acres to several thousand acres. The more modern highe dams, instead of being of earth, are sometimes built of masonry, but as a rule th construction is of very simple type. When one reservoir is filled with sediment in th course of time, another is constructed either above or below it, and the surface of wh was the older reservoir is converted into cultivated fields.

The most picturesque works, however, are the great canals of the northern plain in magnitude they far exceed many waterways built in other parts of the world. The are in effect artificial rivers which have been constructed, in many cases, to cross th natural watercourses on huge aqueducts. Occasionally they dive under such channel re-appearing on the opposite side. In building these works, the topography of th country is in general favorable, but many obstacles must be overcome, due to mino irregularities. The silt difficulty is usually present and necessitates the planning of th works in such a manner as to send the excess of silt downstream and to carry a certai proportion of the finer material out upon the land, where it adds to the soil fertility.

F. H. NEWELL.

Recent Progress on the Bagdad Railroad. The construction of the Bagda Railroad east of the Euphrates has been pushed vigorously since the war began. I February, 1915, the railhead had reached Tel-el-Abiad, a distance of 37 miles east of th river (C. Rabot, *La Géogr.*, Vol. 30, July, 1915, p. 288). A few months later, on July 2 1915, the line was opened to traffic as far as Ras-el-Ain (*Board of Trade Journ.*, N

986, Vol. 91, October 21, 1915, p. 205), a distance of approximately 80 miles farther. It is thus shown on the map facing page 288 of this number of the *Review*. Since then the construction has been completed as far as Nesibin, about 65 miles beyond (*Near East*, March 10, 1916, p. 1). On the southeastern end of the line practically no advance has been recorded beyond Samara since the late summer of 1914. This should dispose of the rumor which had been circulated concerning the completion of the line (see note on ''Land Route to India'' in the March *Review*, p. 221).

Harbor Improvements at Cebu. According to the *Weekly Commercial News* of San Francisco (September 18, 1915) the improvement of the port of Cebu, Philippine Islands, was being rapidly advanced by the Bureau of Public Works. It was estimated that the work would be completed in November. This improvement will make Cebu one of the best equipped ports in the Philippines, with 3,000 feet of concrete sea wall, berths for two steamers drawing 30 feet, a fifty-ton crane, and all approaches asphalt-paved.

AUSTRALASIA AND OCEANIA

Geologic Problems of the Pacific Islands. In an address delivered before the American Association for the Advancement of Science at the San Francisco meeting, 1915 (Problems of the Pacific Islands, *Amer. Journ. of Sci.*, Vol. 41, 1916, pp. 154-186) Professor Reginald A. Daly outlines some of the geologic problems awaiting the scientist in the rich field of the Pacific islands. Two fundamental problems, vulcanism and coral reef formation, are briefly discussed in relation to the author's own theories. In respect of vulcanism Daly says ''volcanoes are the surface expressions of great, molten, basaltic wedges locally thrust up into the solid crust. The pulsing life of a volcano is dependent on the size, gas content, and thermal energy of its feeding wedge. Since each wedge is of limited length, width, and height, ultimate extinction of every volcano is to be expected.'' He adduces supporting data from the preponderatingly basaltic and related lavas in the Hawaiian and other Pacific islands of which the petrography is known at least in part, and from recent work on Kilauea, a magnificent locus for the study of active vulcanism. Accumulating data on the coral island problem emphasizes the inadequacy of the Darwinian subsidence theory. Most seriously the famous theory fails to explain the feature, universal throughout the Pacific and Indian Oceans, of smooth lagoon floors at depths nowhere exceeding 300 feet and averaging 150 to 250 feet, and their entire discordance with the wall-like reefs of coral. Daly's glacial-control theory regards all existing reefs as post-glacial and built up on wave-cut platforms, the development of which would be comparatively rapid when protective coral growth was inhibited by too cool ocean temperatures. The depth of the platforms is in accordance with the hypothetical depth required by the post-glacial raising—180 feet—of the level of the tropical seas, plus the limits of effective wave cutting. Similar platforms are encountered outside the coral areas. From this point of view the Great Barrier Reef of Australia is to be regarded as a coral veneer on the northerly part of the continental shelf. But investigation of the problem is only beginning; quantitative and qualitative studies must be carried out in the determination of such aspects as the age and resisting powers of the volcanic islands; the erosive powers of ocean waves and currents; the degree and nature of reef-protection, involving biological and paleontological study of reef fauna; and the topographical characteristics of reef and platform.

Life on the Islands of the Mid-Pacific. Interesting glimpses of the life of the South Sea islander are presented by Dr. Alfred Goldsborough Mayer in one of a series of articles on Polynesia he has recently been contributing to *The Scientific Monthly* (The Islands of the Mid-Pacific, Feb., 1916, pp. 125-149). In spite of their picturesque appearance, the atolls, low-lying and mournfully flat, ill-watered and rarely exceeding one-eighth of a mile in width, harbor the most backward of mid-Pacific populations. So defective is the water-supply that the liquid is as precious to the atoll-islander as it is to the Arab of the desert. ''To obtain it, the natives cut furrows extending diagonally down the stems of cocoanut palms and leading into a cavity cut in the trunk of the tree, within which a few ounces may collect. Failing of the meager supply they resort in time of drought to the mosquito-haunted swamps, which occur here and there in the center of the islet.''

On the large masses of continental rocks such as New Caledonia, as well as on the mid-tropical volcano-islands or the elevated limestone reefs, conditions far more favorable to the development of mankind prevail. The highest culture is therefore restricted to these types. In the protection of the shallow channels between the barrier reefs and the shore, the natives derive an abundant supply of fish for sustenance. The morrow is provided for, and ample leisure under balmy climes marks their lot.

The devastating effects of hurricanes which visit the islands once or twice in generation bring no lesson to the careless inhabitants of the Southern Seas. Althoug villages and settlements are literally swept clean, no effort to construct hurricane-proo houses has ever been made, according to Doctor Mayer. The vision of life he convey in these pleasing lines reveals a careless and resigned attitude of adaptation to natura circumstances on the part of the natives.

OCEANS

Search for Doubtful Islands in the Southern Pacific by the "Carnegie." In the course of the *Carnegie's* circumnavigation of the globe between the fiftieth and sixtieth parallels of south latitude, the Pacific section of which she has just completed, having arrived at South Georgia on January 12 from Lyttelton, New Zealand, which was left on December 6, 1915, a search was made for two islands or island groups which had been reported in the first half of the nineteenth century but whose existence seemed doubtful (*Terrestr. Magnet. and Atmosph. Electr.*, March, 1916, pp. 26-27).

The first of these, the Nimrod Islands, were stated to have been seen by Capt. Henry Eilbech in the ship *Nimrod* in 1828 on her passage from Port Jackson to Rio de Janeiro. The group was placed by him in about 56½° S. and 158½° W., having been seen at a considerable distance. Captain Biscoe sought for the group in 1831 on his Antarctic trip, but the search was ineffectual (A. G. Findlay: Directory of the South Pacific Ocean, 5th edition, revised to 1900). The *Carnegie* would have passed over the charted position of the islands if the wind had not shifted twelve hours too soon. Because of this her course did not bring her nearer than 40 miles. More definite information was gained as to the existence of the other island, Dougherty Island. Dougherty Island was supposed to have been seen by a whaling vessel, the *James Stewart*, Captain Dougherty, on May 29, 1841. The position was only determined approximately, as 59° 20′ S. and 120°20′ W. On September 4, 1859, Capt. E. Keates, of the *Louise* of Bristol, on his passage from Melbourne to St. John, New Brunswick, sighted an island in 59°21′ S. and 119°7′ W. (Findlay, *op. cit.*). As his observations were good, it has generally been assumed that he saw the same island as Captain Dougherty, and Dougherty Island has therefore been generally charted according to Keates's position. On December 25 the *Carnegie* was in the vicinity of the position given for the island. The commander himself went aloft every half hour. Nothing could be seen from the masthead. From here the island, with its reputed height of 80 feet, should have been visible if anywhere within 30 miles of the vessel. Finally, the *Carnegie* passed within 3 miles of the alleged position without seeing any sign of land. It thus seems highly probable that the island does not exist.

An explanation of the cause of this and similar illusions is offered by an incident which occurred on the *Carnegie's* cruise. One afternoon the cry of "land ahead" went up, and what appeared to be a bold, dark rock island was seen. The course was immediately shaped to pass near it. What seemed a rocky cliff, capped with snow, became visible. Nearer approach, however, proved that the supposed island was an iceberg, 225 feet high by a quarter of a mile long. The light was reflected from the perpendicular ice-wall in such a way as to give to the berg the appearance of a huge, dark rock. Some such deception may underlie the reports of the existence of an island in these waters. Indeed, Captain Keates passed several icebergs before sighting the alleged island. He reported an iceberg aground on it whose orientation to the prevailing wind, which was in contrast to that of the other icebergs, confirmed him in his belief that what he saw was an island and not an iceberg. However, he emphasizes the dark color of the island, a criterion which the *Carnegie's* experience has shown to be precarious.

In addition there is always the possibility of a mirage. This is attested by another experience on this cruise of the *Carnegie*, when what appeared to be extensive land was distinctly seen in the direction of Banks Peninsula, at a time when the vessel was 190 miles distant from this prominent projection of the South Island of New Zealand. Similarly, Peary's belief in the existence of Crocker Land has been shown to be based on a mirage. The very party that proved this experienced how persistent a phenomenon it is, for, before reaching the reported position of the land, MacMillan and his companion were also deceived by the phantom.

Current belief in the non-existence of the Nimrod group and Dougherty Island is also reflected on the chart of the Southern Pacific Ocean issued by the U. S. Hydrographic Office (No. 824), on which the designation "position doubtful" on the original edition of 1883 has been changed to "existence doubtful" on the latest revised edition, that of 1912; and on the Prince of Monaco's standard Carte Générale Bathymetrique des

Océans, on the current, second, edition of which (1914) the islands have disappeared entirely, although they were shown on the first edition (1905).

The search for the Nimrod group and Dougherty Island were only incidents in the cruise of the *Carnegie.* In spite of trying weather conditions, the magnetic declination was observed on an average twice daily during the entire trip. The total run from Lyttelton to South Georgia was 5,440 miles, covered in 40 days. The *Carnegie* has thus completed a little less than half of her circumnavigation of the globe in subantarctic waters, the purpose of which it is to amplify the scant data extant on the terrestrial magnetism of these regions.

POLAR

Climate of the South Orkneys. The meteorological and magnetic station established by the Scottish Antarctic Expedition, under Dr. W. S. Bruce, on the South Orkneys, was taken over by the Argentine Government in 1904, and has been maintained since that date as a part of the Argentine Meteorological Service. The personnel of this lonely outpost is relieved once each year, in January or February, when supplies are left for the remaining twelve months. The men are then completely isolated, without mail or cable communication, until the relief vessel returns the following year. It is under these conditions that the observations have been carried on for over eleven years. Volume 16 of the *Annals of the Argentine Meteorological Service* contained the data for 1904. Volume 17 (1912-1913), in two parts, contains the continuation of the observations to the end of 1909. The first part includes the hourly meteorological observations in their yearly sequence; the second, the compilation and discussion of the results from the commencement of the series (March, 1903), and the magnetic observations. The record is a remarkably complete one and, printed *in extenso,* fills two good-sized volumes, numbering over a thousand pages and weighing over eleven pounds. It is a fine record of important scientific work, carried on under conditions of loneliness and hardship. Death has come, more than once, to the little party of observers at their distant post of duty.

The climate of the South Orkneys has many features of interest. The presence or absence of pack ice in the surrounding oceans causes great variations in the monthly, seasonal, and annual temperatures. In some years the climatic features are those that pertain to a continental situation, and in others marine conditions prevail. The islands are situated in the direct track of an Antarctic current, and this, even when no ice is present, brings a constant supply of ice-cold water past the group. The mean annual temperature is 24° Fahr.; the coldest month is July, with 106°; the warmest is February, with about 33°. Hence the mean annual range is about 22.5°. The absolute minimum is —40.2°. The absolute maximum is 47.8°. Apart from foehn influences, the temperature even in summer seldom rises more than 5° to 8° above freezing. A change of wind from an equatorial to a polar quarter, or vice versa, is accompanied by a large change of temperature. The southerly winds, blowing from the continental ice sheet, are the coldest. ''Frozen fogs'' and snowdrifts make it very difficult to keep the wet-bulb thermometers in condition. A minimum relative humidity of 35 per cent was recorded during a foehn. The maximum hours of sunshine recorded in any month was 120. There are, on the average, 188 sunless days in the year. The mean annual cloudiness is 8.5, the South Orkneys being thus situated in one of the most cloudy regions in the world. For the year the prevailing direction of the cloud motions is west (30 per cent); followed by southwest (27 per cent). The mean hourly velocity of the wind is 13 miles. One storm lasted 37 hours, with a mean wind velocity of nearly 45 miles an hour, and a maximum velocity of 69 miles. Snow falls on the average on 254 days in the year; rain on 113; hail on 27. The mean annual precipitation is 17.60 inches. The maximum depth of snow (end of November usually) is 25.75 inches. The maximum depth recorded was 40 inches. Dew is rarely experienced, since in the calm, clear weather required for its formation, the temperature, even in summer, nearly always falls below freezing, so that hoar frost is deposited. The very rare thunderstorms are nocturnal.

R. DeC. Ward.

PHYSICAL GEOGRAPHY

Radioactivity and the Solution of Problems of Geological Time. Radioactivity affords science a new medium for the measurement of the age of the earth. The discovery of the constant emission of heat by radioactive minerals has necessitated a revision of the physicist's determination of the age of the earth based on the rate of cooling. Uranium and thorium in the rocks of the earth's crust must be considered as the supply according to Arthur Holmes (Radioactivity and the Measurement of

Geological Time, *Proc. Geologists' Assoc.*, Vol. 26, 1915, Pt. 5) of at least three-quarters of the total terrestrial heat. Retaining Kelvin's assumption of an initially molten surface, in no wise negatived by the principles of radioactivity, the age of the earth must then be increased to not less than 1,600 million years. The other phenomenon of importance in this connection is the evolution of stable products, helium and lead, by the disintegration of the unstable uranium and thorium. Radioactive minerals contain derivative helium and lead in amounts proportional to their age. The rates of chemical transformation have been established; hence, if the amount of the derived element be determined, the age of the containing mineral is known, assuming that it was free from original helium or lead at the time of genesis and that none of the derived product has been subsequently lost. In the case of helium the latter condition is never fulfilled: the element is slowly lost by dissipation; consequently the determination of helium will only give minimum age. More satisfactory results are obtained from the determination of lead. Provided that the radioactive mineral is free from original lead and from alteration products of contact generation the proportion of lead to uranium will be a constant whose value is determined by its age; the older the mineral the larger the lead ratio. For the establishment of geological age where the ordinary data are scant or lacking, as in the case of the pre-Cambrians and of many igneous intrusives, this radioactive method should prove of great value.

GEOGRAPHICAL NEWS

Present Plans of the U. S. Geological Survey for Field Work in Alaska. In accordance with plans approved by Secretary of the Interior Lane, the investigation of the mineral resources of Alaska by the U. S. Geological Survey will be continued this year by twelve parties. Congress has recognized the necessity of preparing in advance for the survey of this difficult field by including the appropriation for its continuation in the Urgent Deficiency Act, which was approved on February 28. This prompt action makes it possible to plan the work in advance of the opening of the field season and to carry out the plans efficiently and economically.

The work to be done this year includes a detailed survey of the region tributary to Juneau, which is the most important quartz camp in Alaska. A continuation of the study of the mineral resources of the Ketchikan district, where there are important gold and copper mines, is also planned. The investigation of the water powers of southeastern Alaska will also be continued. Only one party will be employed in the Copper River region. Two parties will work in Prince William Sound.

Four parties will make surveys in the region directly or indirectly tributary to the government railroad under construction (cf. *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 924). One of them will study the new Tolovana placer district and also make some supplementary investigation of the Fairbanks lode district. The geologist of this party will later visit the Nome district. A detailed geologic survey will be made of the western part of the Nenana coal field, which is adjacent to the route of the government railroad. Two other parties will be employed in carrying reconnaissance surveys westward from the railroad route to the Kantishna placer and lode district. It is also proposed to make surveys of the lower Yukon, including the Marshall placer district (*U. S. Geol. Surv. Press Bull. No. 233*).

Addition of Geography to the Curriculum of the University of Michigan. With the opening of the academic year 1915-16, geography has been formally added to the work in geology at the University of Michigan, the name of the department being changed to Department of Geology and Geography. Geography has also been made one of the subjects open to election by freshmen in the College of Literature, Science, and the Arts and continues through the year four times weekly, the work of the first semester being devoted to physiography and that of the second semester to anthropogeography. The work in physiography is conducted as heretofore by Assistant Professor Irving D. Scott, and Carl Ortwin Sauer, Ph.D. (University of Chicago), has been appointed instructor in geography. About 150 students have been enrolled in the freshman course, and a course in commercial geography given during the present semester has been elected by 115 students, showing plainly the need for such training at the university.

During the coming summer session of the university there will be included geography work in charge of Doctor Sauer, and in the next academic year, in addition to freshman work and the course in commercial geography, courses in the Geography of North America and Geographic Influences in American History will be offered.

During the present academic year a series of illustrated lectures by non-resident lecturers is being delivered to popular audiences in the new auditorium of the Natural

Science Building. The following have already been given: Miss Dora Keen, Philadelphia, "The First Ascent of Mount Blackburn," November 11, 1915; Dr. Ellsworth Huntington, Milton, Mass., "Weather, Work, and Human Activity," December 2, "The Ideal Climate and the Distribution of Civilization," December 3, "The Past Distribution and the Cause of Climatic Changes," December 3; Professor R. H. Whitbeck, University of Wisconsin, "Some Geographical Influences upon the Trend of Civilization," February 24, 1916, "The Reclamation of Desert Lands," February 25; Professor Walter S. Tower, University of Chicago, "Northern Chile and the Nitrate Industry," March 10, "A Journey Through Argentina," March 10; Miss Ellen Churchill Semple, Louisville, Ky., "The Barrier Boundaries of the Mediterranean in the Present War," March 31, "Geographic Influences in Japan," March 31. The topics of the lectures still to be given are: Professor J. Russell Smith, University of Pennsylvania, "Tree Crops and Conservation," April 21, "The Desert and the Desert's Edge," April 21; Dr. Edward L. Stevenson, Secretary, The Hispanic Society, New York City, "The Expansion of Geographic Knowledge in the Middle Ages and Its Record as Given by the Map-Makers," May 4; "Early Discovery and Exploration in the New World as Represented by Contemporaneous Map-Makers," May 5.

Centennial Exercises of the U. S. Coast and Geodetic Survey. The hundredth anniversary of the founding of the U. S. Coast and Geodetic Survey was celebrated in Washington with appropriate ceremonies on April 5 and 6. In addition to the varied program of addresses listed below, there was an exhibitit at the New National Museum illustrating the work of the Survey. Surveying instruments and appliances, pictures of surveying operations and equipment, and charts and the publications of the Survey were shown. As far as possible the earliest instruments and appliances were exhibited beside those now in use, and the earliest available maps and charts of the United States were shown in comparison with the present charts issued by the Survey. The exercises terminated with a banquet at the New Willard Hotel on April 6 at which the President of the United States, the Minister of Switzerland, the Secretary of the Navy, the Secretary of Commerce, and Dr. T. C. Mendenhall were the speakers.

The papers read at the scientific sessions included a number by the heads of various interested government bureaus on the work of their respective organizations and its relation to the work of the Survey. The following heads of bureaus spoke: Dr. George Otis Smith, Director of the U. S. Geological Survey; Brigadier General W. M. Black, Chief of Corps of Engineers, U. S. Army; Hon. George R. Putnam, U. S. Commissioner of Lighthouses; Dr. Hugh M. Smith, U. S. Commissioner of Fisheries; Dr. S. W. Stratton, Director of the U. S. Bureau of Standards.

The remaining speakers and their subjects were: Dr. Douglas Wilson Johnson, Associate Professor of Geology, Columbia University, "The Contribution of the U. S. Coast and Geodetic Survey to Physical Geography"; Rear Admiral J. E. Pillsbury (Retired), U. S. Navy, "Ocean Currents and Deep Sea Explorations of the U. S. Coast and Geodetic Survey"; Dr. Charles Lane Poor, Professor of Celestial Mechanics, Columbia University, "Oceanic Tides, With Special Reference to the Work of the U. S. Coast and Geodetic Survey"; Mr. George Washington Littlehales, Hydrographic Engineer, U. S. Hydrographic Office, "Hydrography and Charts, With Special Reference to the Work of the U. S. Coast and Geodetic Survey"; Dr. Louis A. Bauer, Director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, "The Work Done by the U. S. Coast and Geodetic Survey in the Field of Terrestrial Magnetism"; Prof. William Henry Burger, Professor of Civil Engineering, Northwestern University, "The Contribution of the U. S. Coast and Geodetic Survey to Geodesy"; Hon. J. Hampton Moore, Member of the U. S. House of Representatives, "The U. S. Coast and Geodetic Survey's Part in the Development of Commerce"; Rear Admiral Richard Wainwright (Retired), U. S. Navy, "The Civil War Record of the U. S. Coast and Geodetic Survey, and What the Survey Is Doing Towards Preparedness"; Dr. Otto Hilgard Tittmann, President of the National Geographic Society, "The International Work of the U. S. Coast and Geodetic Survey."

The Coming Session of the National Conservation Congress. This year's session of the National Conservation Congress will be held in Washington, D. C., May 2-4. The subject for discussion is "The Conservation of National Strength and Efficiency." Among the leading topics for consideration are: "Know America," "Americanization," "Mobilization of Resources," and "Educational Preparedness." About five hundred persons are at work in the various committees of the congress drafting reports which will be presented for consideration. These committees cover such subjects as mineral fuels, iron, soils, water power, nitrate and phosphate preparedness, forests, wild life, cotton, wool, sugar, cattle, irrigation, manufactures, transportation, human resources. The officers are as follows: President, E. Lee Worsham, Atlanta, Ga.; Vice-Presidents, Dr. Henry S. Drinker, South Bethlehem, Pa., and Mrs. Percy V. Pennybacker, Austin, Tex.; Treasurer, Norman C. McLoud, Cleveland, Ohio; Chairman, Executive Committee, Dr. G. E. Condra, Lincoln, Nebr.; Executive Secretary, Thomas R. Shipp, Washington, D. C.

PERSONAL

Mr. Roy C. Andrews, assistant curator of mammalogy at the American Museum of Natural History, left on March 17 for a zoölogical expedition to China under the auspices of the Museum. The field of study will be the province of Kwei-chau, which will be reached via the Sikiang River.

Dr. L. A. Bauer, director of the Department of Terrestrial Magnetism of the Carnegie Institution, gave an illustrated lecture on February 26 before the Brooklyn Institute of Arts and Sciences on ''The Earth, A Great Magnet.'' The subject-matter was essentially the same as that of Doctor Bauer's address at the first joint meeting of the American Geographical Society and the Association of American Geographers, which was printed in the July, 1914, *Bulletin* (Vol. 47, pp. 481-499) of our Society.

Prof. Charles P. Berkey, of the Department of Geology at Columbia University, has been granted a leave of absence for the winter session of the academic year 1916-17.

Dr. Fay Cooper Cole, assistant curator of anthropology in the Field Museum of Natural History, Chicago, spoke on March 28 before the Brooklyn Institute of Arts and Sciences on ''Wild Tribes of the Philippines.''

Mr. J. S. Diller, of the U. S. Geological Survey, on March 13 addressed the Physiographer's Club at Columbia University on ''Lassen Peak, Our Most Active Volcano.''

Mr. S. V. Gibson, district commercial manager of the New York Telephone Company, gave an illustrated lecture on February 28 before the Brooklyn Institute of Arts and Sciences on ''The History of Communication.''

Dr. M. A. Howe, curator of the museums of the New York Botanical Garden, spoke on March 14 before the Torrey Botanical Club on ''Reef-Building and Land-Forming Algæ.''

Prof. Harold Jacoby, of the Department of Astronomy of Columbia University, gave a lecture on March 6 before the Columbia University Institute of Arts and Sciences on ''The Earth's Rotation'' at which the Foucault experiment was repeated. He also lectured on February 24 before the Brooklyn Institute of Arts and Sciences on ''Navigation, or How Ships Find Their Way Across the Ocean.''

Prof. Douglas W. Johnson, of Columbia University, repeated his lecture on ''The Surface Features of Europe as a Factor in the War,'' on March 2 before the Washington Academy of Sciences. He has been giving a popular course of three lectures on the ''Interpretation of Scenery,'' both before the Brooklyn Institute of Arts and Sciences and the Columbia University Institute of Arts and Sciences. The subjects of the individual lectures, which were given mainly in March, were ''Plains and Plateaus,'' ''Mountains,'' and ''Volcanoes.''

Prof. A. L. Kroeber, of the University of California, spoke on February 28 in New York before the American Ethnological Society on ''The Zuñi Clan.''

Dr. Willis T. Lee, of the U. S. Geological Survey, read a paper on March 20 before the New York Academy of Sciences on ''Application of Physiographical Methods to the Correlation of Non-Marine Formations in the Rocky Mountains.''

Prof. C. T. Macfarlane, professor of geography in Teachers College, Columbia University, has been granted leave of absence for the winter or spring session of the academic year 1916-17.

Baron Erland Nordenskiöld, the Swedish anthropologist, spoke before the Berlin Anthropological Society on April 17, 1915, on the results of his latest expedition in the boundary districts of Bolivia and Brazil.

Dr. Ida Helen Ogilvie, of the Department of Geology of Barnard College, has been promoted from assistant to associate professor.

Dr. K. T. Preuss, of the Berlin Museum of Ethnography, was engaged, according to last reports, in an ethnographical expedition to the Arhuaco Indians of the Sierra

Nevada de Santa Marta in Colombia, a tribe related to the ancient Chibchas, whose language and customs they have in part retained.

Knud Rasmussen, the Danish explorer, has completed plans for a new expedition to northern Greenland on which he will start early in the spring, according to press despatches. He will explore the region where Peary Land—a peninsula and not an island, as Mylius Erichsen's expedition proved—joins the mainland, especially Independence Fiord, on the east, and Nordenskiöld Inlet and Sherard Osborn Fiord on the west. He will be accompanied by Peter Freuchen as cartographer and Lange Kock as geologist.

Dr. Emilia Snethlage, of the Museu Goeldi of Para, Brazil, has returned from another expedition to the region between the middle reaches of the Xingú and Tapajoz, which she explored in 1909 (cf. references in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 717 and 870, and Vol. 46, 1914, p. 228). She again ascended the Iriri, an important left affluent of the Xingú, and the Curuá, the main tributary of the Iriri. On the Curuá she reached 9° S. latitude, two and a third degrees farther upstream than on her 1909 expedition. Doctor Snethlage brought back important ethnographic collections from the Indians living along these watercourses, the Chipayas and the Curuahés. On the upper Curuá Doctor Snethlage lost a finger through the bite of a *piranha*, the ''man-eating'' fish described so graphically in Colonel Roosevelt's account of his Brazilian trip.

Mr. R. R. Stewart spoke on February 22 before the Torrey Botanical Club on ''The Agriculture of the Punjab, India.''

Archdeacon Hudson Stuck gave an illustrated lecture on March 10 before the Geographic Society of Chicago on ''The Ascent of Mt. McKinley.'' Archdeacon Stuck, it will be remembered, made the first complete ascent of this, the highest known peak in North America (see *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 204).

OBITUARY

Dr. C. Willard Hayes, whose untimely death occurred on February 9 at his home in Washington, D. C., was one of the early workers who contributed most significantly to the organization and development of the modern science of physiography in this country. A graduate of Oberlin and of Johns Hopkins University, and with wide field experience in Alaska and Nicaragua as well as in the United States, he had an unusual background against which to project and test out the theories of physiography. Doctor Hayes's contributions to geology and economic geology were very many, through his lifelong association with the U. S. Geological Survey as geologist and later as chief geologist.

In all his significant papers his interest in physiography is clearly shown, for its problems were ever present in his mind. His most constructive contributions, because of their strength, foresight, and opportuneness, were his paper on the ''Geomorphology of the Southern Appalachians,'' written in association with Marius R. Campbell (*Natl. Geogr. Mag.*, 1894-95, pp. 63-126; summarized by Hayes alone in ''The Southern Appalachians,'' National Geogr. Monographs, pp. 305-336, Amer. Book Co., New York, 1896), and his ''Physiography of the Chattanooga District'' (*19th Annual Rept., U. S. Geol. Survey, 1897-98*, Pt. II, pp. 1-58). It was a fortunate thing for the science that Dr. Hayes's life for many years was given to the study of the Southern Appalachians, so rich in physiographic problems. His work was constructive and lasting, and his reputation as one of the makers of physiography will be permanent.

Richard Elwood Dodge.

Sir Arthur Rücker died on November 1, 1915. His magnetic surveys of the British Isles, in conjunction with Sir Edward Thorpe, for the epochs 1886 (published in 1890) and 1891 (published in 1896) are of geographical interest.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the January number, pp. 57-61

NORTH AMERICA

UNITED STATES

General

WOODSON, C. G. **The Education of the Negro Prior to 1861: A History of the Education of the Colored People of the United States from the Beginning of Slavery to the Civil War.** 454 pp. Bibliogr., index. G. P. Putnam's Sons, New York, 1915. $2. 8 x 5½.

The book is a clearly written and somewhat detailed account of negro education in America from early colonial days to the War of Secession. The facts are grouped around the well-sustained central thread of the white man's changing attitude toward the negro. At first the colonists feared to educate the newly arrived Africans for fear that education would mean Christianization. That would have necessitated liberation, for the church forbade the enslavement of Christians. Then the prelates of the Church of England declared that Christians of African descent might be kept in servitude. Thereupon educational facilities slowly increased for a century and a half. By about 1830 a considerable number of schools for free negroes were in operation not only in the North but in the South. The next step was a strong reaction, especially in the South. Its cause was partly the invention of the cotton gin, the steam engine, and other forms of machinery which caused the demand for cotton to increase enormously. Cotton picking requires an abundance of the cheapest, least intelligent kind of labor. Educated negroes are of little use in cotton fields. The other cause of the setback of negro education was the growing abolition movement in the North, which aroused insurrections among the slaves and alarmed the slave holders. The owners of slaves feared that more education would increase the demand for freedom.

Mr. Woodson's book is geographical only as it indirectly illustrates the contrast in the attitude of the North and South. Even in the days when both sections believed in slavery, the climatic contrast caused them to view the negro problem in different lights.

ELLSWORTH HUNTINGTON.

ARNOLD, RALPH. **The Petroleum Resources of the United States.** *Econ. Geology*, Vol. 10, 1915, No. 8, pp. 695-712.

CAMERON, F. K. **Possible Sources of Potash in America.** *Journ. Franklin Inst.*, Vol. 180, 1915, No. 6, pp. 641-651. [Abstracted in the March *Review*, p. 217.]

CHURCH, J. E., JR. **Snow Surveying: Its Problems and Their Solution.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 607. [Author's abstract of paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. "The problem of precipitation and run-off has become the dominant meteorological problem in the semi-arid states where irrigation is fundamental to agriculture."]

—— **Climatological Data for the United States by Sections, December, 1915 (Vol. 2, No. 12).** Maps, diagrs. *U. S. Weather Bur. [Publ.] No. 571.*

FRANKENFIELD, H. C. **Sleet and Ice Storms in the United States.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 608. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

GEYER, O. R. **Coming Restoration of the Mississippi as an Important Artery of Commerce.** Ills. *Sci. Amer.*, Vol. 114, 1916, No. 9, pp. 215, 228, and 229.

HAZARD, D. L. **Distribution of the Magnetic Declination in the United States for January 1, 1915.** 16 pp. Map. *U. S. Coast and Geod. Surv. Special Publ. No. 33.* Washington, D. C., 1915. [See "A New Isogonic Chart of the United States" under Geographical Record in this number, p. 298.]

HUMPHREYS, W. J. **Earthquakes Felt in the United States During 1915.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 634-635.

KULLMER, C. J. **Monthly Storm Frequency in the United States.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 610. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. "The present investigation covers the 30-year period 1883-1912 and furnishes a 30-year map of the distribution of storms for each month and also three 10-year maps for each month covering the same period.'']

LANE, F. K. **Economic Preparedness: Our Natural Resources and How They Are Being Developed.** *Sci. Amer.*, Vol. 114, 1916, March 4, pp. 237 and 258.

LUSCHAN, FELIX VON. **Die Neger in den Vereinigten Staaten.** *Kolon. Rundschau*, 1915, No. 11-12, pp. 504-540. Berlin.

MATTOON, W. R. **Shortleaf Pine: Its Economic Importance and Forest Management.** 66 pp. Map, diagrs., ills. *U. S. Dept. of Agric. Bull. No. 308.* Washington, D. C., 1915. [A text-map shows the geographical and commercial distribution of the shortleaf pine in the United States.]

MCSWEENEY, E. F., J. A. CONRY, AND LOMBARD WILLIAMS. **Analysis of the Present Foreign Trade of the United States.** 19 pp. *Directors of the Port of Boston Bull. No. 3.* Boston, 1916. [Claims that less than one-third of the $1,000,000,000 trade balance of the United States for the year ending June 30, 1915, represents permanent trade, i. e. a smaller figure than those for the previous four years.]

NORTHROP, J. D. **Petroleum in 1914.** pp. v and 893-1098. *Mineral Resources of the U. S., 1914,* Part II. U. S. Geol. Survey, Washington, D. C., 1916.

—— **Shipping Industry, Fortunes of the.** *The Nation,* No. 2645, Vol. 102, 1916, pp. 294 295.

SMITH, J. R. **Farming Appalachia.** Ills. *Amer. Review of Reviews,* Vol. 53, 1916, No. 3, pp. 329-336. [A plea for national mountain farming—for the cultivation of such important tree crops as the mulberry, pecan, and chestnut, accompanied with raising of hogs. Present farming in Appalachia is contrasted with conditions in Corsica, where the chestnut and goat play so important a part in the farm economy.]

STERRETT, W. D. **The Ashes: Their Characteristics and Management.** 88 pp. Maps, diagrs., ills. *U. S. Dept. of Agric. Bull. No. 299.* Washington, 1915. [Accompanied by a map of the United States east of the 100th meridian, 1:7,400,000, showing the commercial distribution of the ash tree as indicated by Census returns of lumber cut by counties in 1910.]

—— **Thunderstorms in the United States, 1904-1913, Percentage Frequency of.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 619-620.

WARD, R. DEC. **The Thunderstorms of the United States as Climatic Phenomena.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 612. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. See also the note under Geographical Record in this number on the ''Distribution of Thunderstorms in the United States,'' p. 297.]

—— **War-Time Commerce, Historic Results of.** *The Nation,* No. 2643, Vol. 102, 1916, pp. 233-234. [An interesting feature of the United States trade of 1915 is the rise in value of ''foreign merchandise reëxported.'' It exceeds for the first time since 1806 the figures of the Napoleonic maximum, when neutral American shipping commanded the West Indian export trade.]

South Atlantic States

—— **Baltimore, Consular District of (Comprising the States of Maryland, Virginia, and West Virginia), Trade of the, Report for the Year 1914 on the.** 48 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5543. London, 1915.

—— **Hydro-Electric Systems, Interconnected, in the South.** Map. *Bull. Atlantic Deeper Waterways Assoc.*, Vol. 8, 1916, No. 3, pp. 17-18.

PRATT, J. H., AND H. M. BERRY. **Proceedings of Seventh Annual Drainage Convention of the North Carolina Drainage Association Held at Wilson, North Carolina, Nov. 18 and 19, 1914.** 76 pp. Diagrs., bibliogr. *North Carolina Geol. and Econ. Surv. Econ. Pap. 41.* Raleigh, 1915. [Includes papers on principles of drainage and drainage legislation in North Carolina.]

ROSS, F. E. **Latitude Observations with Photographic Zenith Tube at Gaithersburg, Md.** Diagrs., ills. *U. S. Coast and Geod. Surv. Special Publ. No. 27.* Washington, D. C., 1915.

—— **Savannah, Consular District of, Trade of the, Report for the Year 1914 on the.** 41 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5548. London, 1916. [While the cotton trade in general suffered heavily, the product known as ''linters''—the fiber removed in the final ginning of the seed—acquired a new importance from its use in the manufacture of explosives; export and price increased concomitantly.]

North-Central States

—— **Homeseeker, A Personal Word with the.** 72 pp. Map, ills. *Wisconsi Dept. of Agric. Bull. No. 2.* Madison, 1916. [General summary of Wisconsin's resources, with emphasis on agriculture, to attract intending settlers.]

Hore, R. E., W. E. Hopper, and R. A. Smith. **Mineral Resources of Michigan with Statistical Tables of Production and Value of Mineral Products for 191 and Prior Years.** 359 pp. Maps, diagrs., ills. *Michigan Geol. and Biol. Surv. Pub 19: Geol. Series 16.* Lansing, 1915.

Smith, J. W., and C. A. Patton. **Ohio Weather for 1914.** pp. 293-372. Maps *Ohio Agri. Exper. Sta. Bull. 287.* Wooster, Ohio, 1915. [The usual summary o records has been supplemented with a series of diagrammatic maps.]

—— **St. Paul, City of, Annual Report of the Commissioner of Public Work of the, for the Year Ending December 31, 1914.** 172 pp. Maps, diagr., index [Material for city geography in the set of five maps, 1:27,600, showing extent of graded paved, and sprinkled streets, parkways, sewers, and the type of railroad crossings, an in the set of three maps, 1:63,360, showing ward boundaries, territorial growth, an land owned by railroad companies.]

Original forest and prairie area in Illinois. 1:3,500,000 approx. Accompanies “A Ecological Study of Prairie and Forest Invertebrates,” by Charles C. Adams, *Bull. Illinoi State Lab. of Nat. Hist.*, Vol. 11, Art. 2. Urbana, 1915. [The paper was reviewed in th February *Review*, pp. 166-167.]

Western States

Darton, N. H., and Others. **Guidebook of the Western United States. Part C The Santa Fe Route, with a Side Trip to the Grand Canyon of the Colorado.** iv and 194 pp. Maps, ills. *U. S. Geol. Surv. Bull. 613.* Washington, 1915. $1.

This is the second of the U. S. Geological Survey's four transcontinental guides two of which have already been reviewed (Northern Pacific route, Feb. *Review*, p. 153; Overland route, *Bull. Amer. Geogr. Soc.*, Sept., 1915, pp. 697-698.) Twenty-four map on the scale of 1:500,000 represent continuous topography from Kansas City to Lo Angeles. At least, it would be continuous topography did not the over-printing o geology in red on them greatly mar their legibility, which is a pity, indeed. Th book is designed for the general traveler, who cannot be assumed to read topographic maps. But he *is* an intelligent person in this country and would quickly learn if given a fair chance. For the most part he will think he is given too much geology. All that helps to an understanding of topography, resources, or history, is good, and most of Darton's geology stands that test. Perhaps the animals of the remote past might have been spared. The text narrates the history of much of the exploration, settlement, and development of the region. It is concise, pointed, and well selected with regard to landmarks along the route. The book will make a trip over the Santa Fe more interesting than ever. The twenty-four maps alone, if freed of their red overprint, would be worth half the price of the volume.

Mark Jefferson.

Allen, G. F. **Forest Types in the Rainier National Park.** Ills. *The Mountaineer*, Vol. 8, 1915, Dec., pp. 53-60. Seattle.

Alter, J. C. **Weather Bureau Exhibit at San Francisco, 1915.** Ills. *Monthly Weather Rev.*, Vol. 43, 1915, No. 9, pp. 452-454.

Baker, C. C. **Mexican Land Grants in California.** *Ann. Publs. Hist. Soc. of So. California*, Vol. 9, Part 3, pp. 236-243. Los Angeles, 1914. [See note with same title in the March *Review*, p. 219.]

Baker, C. C. **The Rise and Fall of the City of Gladstone.** *Ann. Publs. Hist. Soc. of So. California.* Vol. 9, Part 3, pp. 188-194. Los Angeles, 1914. [See note with same title under "Geographical Record" in this number, p. 297.]

Beal, C. H. **The Earthquake in the Imperial Valley, California, June 22, 1915.** Maps, ills. *Bull. Seismolog. Soc. of Amer.*, Vol. 5, 1915, No. 3, pp. 130-149. [Abstracted in the Feb. *Review*, pp. 142-143.]

Cleland, R. G. **The First Expedition of Jedidiah S. Smith to California.** *Ann. Publs. Hist. Soc. of So. California*, Vol. 9, Part 3, pp. 200-203. Los Angeles, 1914.

Cole, Mrs. Cornelius. **To California via Panama in 1852.** *Ann. Publs. Hist. Soc. of So. California*, Vol. 9, Part 3, pp. 163-172. Los Angeles, 1914.

Daniels, Mark. **The Sequoia National Park.** Ills. *Amer. Forestry,* No. 265, Vol. 22, 1916, pp. 12-21. [Excellent photographs.]

Davis, E. F. **The Earthquakes of October 7, 1915, in Central California.** Map, diagrs. *Bull. Seismolog. Soc. of America,* Vol. 5, 1915, No. 4, pp. 230-235.

Diller, J. S. **Mount Shasta: Some of Its Geologic Aspects.** Maps, ills. *Mazama,* Vol. 4, 1915, No. 4, pp. 11-16. Portland, Ore.

Hardesty, W. P. **Physical Geography of Mount Shasta Region.** Ills. *Mazama,* Vol. 4, 1915, No. 4, pp. 17-18. Portland, Ore.

Houston, D. F. **The National Forests.** Ills. *Amer. Forestry,* No. 267, Vol. 22, 1916, pp. 153-157.

Jones, J. C. **The Pleasant Valley, Nevada, Earthquake of October 2, 1915.** Maps, diagr., ills. *Bull. Seismolog. Soc. of America,* Vol. 5, 1915, No. 4, pp. 190-205.

Matthes, F. E. **The Survey of Mount Rainier.** Diagrs., ills. *The Mountaineer,* Vol. 8, 1915, Dec., pp. 61-66. Seattle.

McKee, R. H. **The Glaciers of Mount Rainier in Comparison With Other Well-Known Systems of Glaciers.** Ills., bibliogr. *The Mountaineer,* Vol. 8, 1915, Dec., pp. 73-74. Seattle.

Monnet, Paul. **Le Grand Désert americain.** *La Géogr.,* Vol. 30, 1914-15, No. 5, pp. 408-411. Paris. [The author infelicitously revives the long-since discarded term of 'Great American Desert'' to designate the arid and semi-arid regions of the Cordillera.]

—— **Mount Rainier National Park Number.** 118 pp. Map, diagrs., ills. *The Mountaineer,* Vol. 8, 1915, Dec. Seattle. [Individual articles of geographic interest isted above.]

—— **Portland, Oregon, Consular District of (Comprising the States of Oregon, Washington, Idaho and Montana, and the Territory of Alaska), Trade of the, Report for the Year 1914 on the.** 80 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5540. London, 1915.

Saunders, E. J. **The Geological Story of Mount Rainier.** Diagr., ills. *The Mountaineer,* Vol. 8, 1915, Dec., pp. 67-72. Seattle.

Wilcox, W. F. **San Miguel River Canyon Flume—A Monument of Gold Mining Failure.** Ills. *Sci. Amer.,* Vol. 114, 1916, Jan. 29, No. 5, p. 123. [In western Colorado, near the Utah line.]

Wood, H. O. **On a Possible Causal Mechanism for Heave-Fault Slipping in the California Coast Range Region.** Diagrs. *Bull. Seismolog. Soc. of America,* Vol. 5, 1915, No. 4, 214-229.

Panoramic view of the Rocky Mountain National Park, Colorado. 1:125,000. Department of the Interior, [Washington], [1915?].

Panoramic view of the Mesa Verde National Park, Colorado. 1:45,000. Department of the Interior, [Washington], [1915].

Mexico and Central America

Baschin, O. **Schweizerische Expedition nach der Mexikanischen Halbinsel Niederkalifornien.** *Die Naturwissenschaften,* Vol. 4, 1915, No. 53, pp. 723-724. [Abstract of a lecture by Arnold Heim on Lower California before the Berlin Geographical Society on Dec. 4, 1915.]

Flores, T. **El mercurio en Mexico.** *Bol. Minero,* Vol. 1, 1916, No. 1, pp. 13-14. Depart. de Minas, Direcc. de Minas y Petroleo, Secr. de Fomento, Colon. e Industr., Mexico.

Frank, J. C. **American Interoceanic Canals: A List of Works in the New York Public Library.** *Bull. New York Public Library,* Vol. 20, 1916, No. 1, pp. 11-81.

Ham, C. D. **Americanizing Nicaragua.** Map, ills. *Amer. Review of Reviews,* Vol. 53, 1916, No. 2, pp. 185-191.

Huebner, G. G. **Economic Aspects of the Panama Canal.** *Amer. Econ. Rev.,* Vol. 5, 1915, No. 4, pp. 816-829.

Landa, Luis. **Present Condition of Meteorology and Seismology in Honduras.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 12, p. 610. [Author's abstract of a paper ead at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

Ordóñez, E. **Las principales unidades geográficas mexicanas y la distribución de los criaderos minerales.** *Bol. Minero,* Vol. 1, 1916, No. 2, pp. 55-57. Depart. de

Minas, Direcc. de Minas y Petroleo, Secr. de Fomento, Colon. e Industr., Mexico. [general statement of the geographical provinces of Mexico preliminary to a discussio to be subsequently published, of the regional distribution of the mineral deposits. Th author urges the restriction of the term "Mesa Central" to the southern portion of th Mexican plateau, which he would divide into two parts: (1) the "Mesa Central," o Plateau of Anahuac, and (2) the "Gran Cuenca Mexicana," or the Great Basin regio of northern Mexico, characterized by bolsons, interior drainage, and aridity.]

—— **Panama, L'obstruction du canal de.** Ills. *La Nature*, No. 2207, 1916, Ja 15, pp. 47-48.

Slosson, E. E. **Lower California: Why We Need It and It Needs Us.** Ma *The Independent*, No. 3506, Vol. 85, 1916, pp. 227-228.

—— **Yucatan, Estado de, Boletín mensual de la Sección Meteorológica de Año meteorológico de 1915 á 1916, mes de Julio de 1915,** pp. 755-794; **mes d Agosto de 1915,** pp. 795-836. Merida de Yucatan, Mexico, 1915.

SOUTH AMERICA

General

Bowman, Isaiah. **South America: A Geography Reader.** xxii and 354 pp. Map ills., index. Rand, McNally & Co., Chicago, 1915. 75 cents. 7 x 5.

There is no mistaking the keynote of this little book as *human*. Throughout it a mirably exemplifies the relations between man and nature. The reviewer does not kno whether the school children it was written for will like it, but it is just what he wan for one of his classes, as it really pictures South American life. The material is exc lently chosen and well illustrated: characteristic aspects of life and not merely stran ones are described, and the pictures belong to the argument instead of hailing from t office scrapbook. The best ones, of course, are the author's own, and the best part o the book is that which deals with the arid west he has known in person. The auth oddly begins at the southern tip of the continent and works northward to Patagoni To the reviewer's taste the Argentine Republic is undertreated. In culture and co merce it now leads the continent by a lead that is absolute, regardless of size or pop lation, and 36 pages are not adequate—10 per cent of the volume. From the viewpoi of geographic interest the author is perhaps justified.

The maps, with the exception of an original vegetation map of the continent, a publisher-made. That facing page 202, where the Xingú River is the topic, has the riv but without the name on it. Peons are not so wholly badly off as represented, and h not Denis told us that the rubber gatherers were mainly not Indians but Ceará men?

Mark Jefferson.

—— **Latin America in 1915: A Review of the Financial, Commercial, Politica and Economic Progress of the Latin-American Republics of Argentina, Braz Chile, Uruguay, Mexico, Peru, etc., in 1915.** *South American Journ.*, Vol. 80, 19 No. 2, pp. 23-54, *passim*. London.

—— **Lima-Buenos Ayres by Rail.** *South American Journ.*, Vol. 70, 1916, No. p. 66. [This topic was discussed in the Jan. *Review*, p. 53.]

Wagner, E. R. **De Santiago del Estero à Rio de Janeiro par le Gran Chaco, haut Parana, et les colonies allemandes: L'expansion allemande et l'aven français dans l'Amérique du sud.** Map. *La Géogr.*, Vol. 30, 1914-15, No. 5, pp. 39 404. Paris. [Abstract of a lecture before the Paris Geographical Society on June 1 1915. The lecture was to be published in full in *La Revue*.]

Traders' map of South America, compiled from official maps of the several Sout American republics and other authoritative sources of information. 1:5,400,000. Gener Drafting Co., New York, 1915.

Ecuador, Peru, Bolivia

Hann, J[ulius] von. **Temperaturverhältnisse von Quito.** Diagrs. *Meteoro Zeitschr.*, Vol. 32, 1915, No. 2, pp. 488-500.

—— **La Quiaca-Tupiza: Rival to Panama Canal.** Map, ills. *Bull. Pan America Union*, Vol. 41, 1915-16, No. 6, pp. 820-835. [Work has been commenced on this pr jected line of about 60 miles that will link up the east and west railroad systems South America via Bolivia.]

Lurquin, Constant. **Contribución geográfica al progreso de Bolivia: Servicio icial de la hora en la República; su utilidad prática i su significación cientifica.** *ol. Soc. Geogr. Sucre,* No. 179-181, Vol. 16, 1915, pp. 141-164. [A discussion of the ojected adoption of Greenwich time as the standard for Bolivia.]

Lurquin, Constant. **Bolivian Meteorology.** *Monthly Weather Rev.,* Vol. 43, 15, No. 12, p. 610. [Author's abstract of a paper read at the Pan American Scientific ngress in Washington, Dec., 1915-Jan., 1916.]

Nordenskiöld, Erland. **Die religiösen Vorstellungen der Itonama-Indianer in olivia.** *Zeitschr. für Ethnol.,* Vol. 47, 1915, No. 2-3, pp. 105-113. Berlin.

Mapa del Perú por la Sociedad Geográfica de Lima, dibujado por Camilo Vallejos Z, rtógrafo de la Sociedad. 1:1,500,000. Editado por la Libreria é Imprenta Gil, Lima, 1912.

Brazil

Beltran y Rozpide, Ricardo. **El Río de los Aripuanas (Roosevelt, Teodoro, astaña ó de la Duda).** *Rev. de Geogr. Colon. y Mercantil,* Vol. 12, 1915, No. 11-12, . 454-458. Real Soc. Geogr., Madrid. [This and the article in the same tenor by ptain Vasconcellos previously listed in the *Bull. Amer. Geogr. Soc.* for Nov., 1915 . 896), belittle Colonel Roosevelt's Brazilian expedition on the ground that the river plored was known to the Portuguese cartographers of the eighteenth century. However, their knowledge was restricted to its mouth—from which they naturally inferred e *existence* of a river—but this, no less than the fact that the rubber gatherers knew s lower course, does not invalidate the claim that the Roosevelt-Rondon expedition was e first to explore and instrumentally survey its whole course.]

Da Cunha, A. P. **Determinação de coordenadas geographicas no estado do eará.** xviii and 171 pp. Map, diagrs., index. *Inspectoria de Obras contra as Seccas ubl. No. 27.* Rio de Janeiro, 1914.

Mattos, J. N. B. **Dados climatologicos do anno de 1911.** 30 pp. Maps. *rviço Meteorol. do Estado de São Paulo Bols. Nos. 21-24, Ser. II.*

Miller, B. LeR., and J. T. Singewald, Jr. **The World's Deepest Mine.** Diagrs., s. *Bull. Pan American Union,* Vol. 41, 1915-16, No. 6, pp. 805-819. [Morro Velho, the gold belt of Brazil.]

Esboço do carta pluviometrica da região semi arida do Brasil, por H. E. Williams e oderic Crandall. 1:3,000,000. Inspectoria de Obras contra as Seccas, Minist. da Viação Obras Publicas, [Rio de Janeiro], 1910.

Mappa parcial do estado da Bahia, pelo engenheiro Roberto Miller. 1:500,000. Inspecria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1913.

Mappa dos estados do Ceará, Rio Grande do Norte e Parahyba, com parte dos estados nitrophes pelo . . . H. E. Williams e Roderic Crandall. 1:1,000,000. Inspectoria de bras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1910.

Mappa do estado da Parahyba. 1:500,000. Inspectoria de Obras contra as Seccas, inist. da Viação e Obras Publicas, [Rio de Janeiro], 1913.

Mappa de parte dos estados de Pernambuco, Piauhy e Bahia, [pelo] engenheiro Roberto iller. 1:500,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras ıblicas, [Rio de Janeiro], 1913.

Mappa parcial do estado do Piauhy, pelo engenheiro H. L. Small. 1:1,000,000. Inspecria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 14.

Mappa geologico da parte norte e central do estado do Piauhy e adjacencias, pelo genheiro Horatio L. Small. 1:1,000,000. Accompanies "Geologia e supprimento d'agua bterranea no Piauhy e parte do Ceará," by H. L. Small, *Inspectoria de Obras contra as ccas Publ. No. 32.* Rio de Janeiro, 1914. [The text was listed in the February *Review,* 154.]

Mappa do estado de Sergipe e da parte nordeste do estado da Bahia, pelo engenheiro H. Sopper. 1:1,000,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e bras Publicas, [Rio de Janeiro], 1914.

Mappa geologico do estado de Sergipe e da parte nordeste do estado da Bahia, pelo genheiro R. H. Sopper. 1:1,000,000. Accompanies "Geologia e supprimento d'agua subrranea em Sergipe e no nordéste da Bahia," by R. H. Sopper, *Inspectoria de Obras contra Seccas Publ. No. 34.* Rio de Janeiro, 1914. [The text was listed in the February *eview,* p. 154.]

EUROPE

British Isles

Innes, A. D. **A History of England and the British Empire. Vol. 1: Before th English Came, to 1845.** xxxiii and 539 pp. **Vol. 2: 1485-1688.** xxxi and 553 p **Vol. 3: 1689-1802.** xxvi and 550 pp. **Vol. 4: 1802-1914.** xxxv and 604 pp. Ma and index in each. The Macmillan Co., New York, 1913, 1914, 1915. $1.60 eac 8 x 5½.

The amount of space assigned to the work required a high power of condensation, an in this the writer excels, giving in general quite clear descriptions of intricate matters i the fewest possible words. The work is largely taken up with the dynastic politics an wars of the country. The accounts of these matters are remarkably well done, and fro the short and plain descriptions of military strategy and battle tactics on sea and lan the general reader, with the help of the well-drawn battle plans, may easily form a goo idea of the military and naval movements. At the close of each volume there are wel written chapters on the manners and customs of the period dealt with, the time-spirit, an the growth of its political, economic, social, educational, financial, and commercial instit tions. The geographical factor in the historical product is recognized and somewh developed, in differentiating the medieval from the modern period; but it might have bee shown with advantage, the British Empire being an island empire, that islands in gener are relatively restricted in area and that hence an island-dwelling nation, as it expan and increases, finally is unable to derive from its native habitat sufficient food to suppo its population and so is forced to draw food supplies from without and, to safeguard the in time of war, is obliged to have food-producing colonies and a merchant marine t carry its food supplies and a strong navy to protect them from the depredations o enemies. Consequently the geographical factor is an all-important element in the evol tion of the British Empire. David H. Buel.

Moss, C. E. **Vegetation of the Peak District.** x and 235 pp. Maps, ills., inde University Press, Cambridge (G. P. Putnam's Sons, New York), 1913.

The survey of the vegetation of Great Britain which is being carried on by membe of the British Ecological Society has received a notable contribution in Doctor Moss volume. The region which he has studied embraces the southern Pennine upland covering portions of four counties in one of the most elevated parts of England. Th plant associations of this region are described in great fullness, their relation to ea other is demonstrated, and the influence of underlying rock in determining their cha acter is particularly well worked out. The woodland, scrub, grassland, and moor o today represent almost entirely areas which were formerly forested. The types of woo land and grassland are quite distinct on siliceous and on calcareous soils, oak and nard being predominant on the former and ash and fescue grass on the latter. Two detaile maps show the distribution of the plant associations and also the extent of cultivatio of wheat and oats; many exceptionally fine illustrations portray typical plant con munities. This well-digested and carefully presented work constitutes one of the bes pieces of recent European vegetational investigation. Forrest Shreve.

Fleming, Rufus. **Scotland.** 11 pp. *Suppl. to Commerce Repts.*, Ann. Series, 191 No. 190. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washingto D. C.

Holst, N. O. **The Ice Age in England.** *Geol. Magazine*, Sixth Decade, Vol. 1915, No. 9, pp. 418-424; No. 10, pp. 434-444; No. 11, pp. 504-513.

—— **Rainfall in 1915, British.** *Nature*, No. 2412, Vol. 96, 1916, Jan. 20, p. 576.

Shaw, W. N. **Organization of the Meteorological Office in London.** *Month Weather Rev.*, Vol. 43, 1915, No. 9, pp. 449-452. [Reprinted from the "Tenth Annu Report of the Meteorological Committee for the Year Ended 31 March, 1915," p 65-74.]

Distribution of vegetation in the Peak District, by C. E. Moss. 1:63,360. Accom panies "Vegetation of the Peak District," by C. E. Moss, Cambridge University Pres Cambridge, 1913. [Book reviewed above.]

Philips' Comparative Series of Wall Atlases: British Isles, edited by J. F. Unstea and E. G. R. Taylor, with explanatory handbook for teachers. 8 maps: 1, relief of land 2, political; 3 and 4, climate; 5, geological; 6, agriculture and fishing; 7, industrial; density of population. [Maps 2, 3, 4, 5, 6, and 8 in 1:1,000,000, 1 in 1:1,500,000, and 7 i 1:750,000.] George Philip & Son, Ltd., London, 1914. [The excellence of this serie which systematically represents all phases of the geography of a region, has been dwel pon before (*Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, p. 640). The larger scale of the resent set, as compared with the continental maps constituting the remainder of the ≥ries, permits of a more intimate treatment.]

Thames valley rainfall, November, 1915. 1:1,267,200. Accompanies, opp. p. 183, *ymons's Meteorol. Mag.*, No. 599, Vol. 50, December, 1915.

SCANDINAVIA, INCLUDING FINLAND

ᑕEY, HELMER. **La vie économique de la Suède.** 166 pp. Plon-Nourrit et Cie, Paris, 1913. 10 x 6½.

The author presents a carefully digested summation of the social and industrial staistics of Sweden for the first decade of the century and from this base produces a shrewd nalysis of the economic situation and forecast of its movement upward in progress. n this we note an omission common to most such treatises on the wealth of any nation, he index of national prosperity exhibited by the movement of population. No state an be said to strike an even or a favorable balance of the common weal when the alance is reached by means of the loss of any considerable mass of its producing opulation. Some reference should have been made to the considerable loss of Sweden's xcellent citizenship which would be under no impulse to come to this country if conditions at home gave promise of prosperity to the individual of ambition.

WILLIAM CHURCHILL.

EADE, ARTHUR. **Finland and the Finns.** xi and 315 pp. Map, ills., index. Dodd, Mead & Co., New York,1915 . $3.00. 9 x 6.

An excellent handbook on Finland, by an English resident (lecturer in English at he University of Helsingfors). The introductory chapter deals with the history, geology, eography, ethnology, and language of Finland. Then follow descriptions of the national novement, the racial struggle, life in town and country, manners, customs, and beliefs. good idea is given of the Finnish epic Kalevala (Hero-land), with an extended ccount of Finnish literature, and music. Other topics discussed are education, politics, ndustry, the labor movement, female suffrage, the position of Finland in the Russian mpire and the process of making Finland a province of Russia. DAVID H. BUEL.

—— **Finland, Befolkningsrörelsen i, åren 1911 och 1912: Befolkningsstatistik.** 09 pp. *Bidrag till Finlands Officiella Statistik No. 46.* Helsingfors, 1915. [Vital tatistics of the population. Captions in Swedish and French.]

—— **Finland, Statistisk Årsbok för, Ny Serie, Tolfte Årgången, 1914.** xxviii nd 649 pp. Map. Utgifven af Statistiska Centralbyrån, Helsingfors, 1915. 9½ x 7. Statistical matter giving revision of 1910 census figures. Data relating to population, griculture, and colonization are important.]

—— **Finlands folkmängd den 31 December 1910 (enligt församlingarnas yrkoböcker): Befolkningsstatistik. Vol. 1: Folkmängden samt befolkningens ördelning efter kön, ålder, civilstånd, sprak, trosbekännelse, bildningsgrad och ödelseort äfvensom den franvarande befolkningens fördelning efter vistelseort.** 21 pp. *Bidrag till Finlands Officiella Statistik No. 45.* Helsingfors, 1915. [Census f Finland for 1910. Size of population and distribution according to sex, age, occupaion, language, creed, education, origin, etc.]

FLODSTRÖM, I. **Till fragan om rasskillnader inom Sveriges befolkning.** Map. *mer*, Vol. 35, 1915, No. 3, pp. 213-266. [Racial composition of the population of weden.]

FOGHT, H. W. **Rural Denmark and Its Schools.** xi and 355 pp. Map, diagrs., ls., index, bibliogr. The Macmillan Co., New York, 1915. $1.40. 7½ x 5.

GAARDER, TORBJØRN. **Surstoffet i fjordene (De vestlandske fjordes hydrografi,**). 200 pp. Diagrs., ill., bibliogr. *Bergens Museums Aarbok, 1915-1916: Naturvidensk. ække*, No. 1, Art. 2. [The oxygen content of the waters of the Norwegian fiords and ts bearing on marine life. Detailed examination of the fiords near Bergen.]

GUINCHARD, J., edit. **Sweden: Historical and Statistical Handbook.** [Issued] y order of the Swedish Government. 2nd edition, English issue. **Vol. 1: Land and eople.** xxvi and 781 pp. **Vol. 2: Industries.** xi and 759 pp. Maps, ills., index. . A. Norstedt & Söner, Stockholm, 1914. 9½ x 6½. [Excellent handbook of the conomic and cultural life of Sweden. German edition reviewed in *Bull. Amer. Geogr. oc.*, Vol. 47, 1915, pp. 786-787.]

HARRIS, E. L. **Sweden.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, o. 16c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, . C. [Geographic location is responsible for Sweden's commercial importance during the present war. Businesses prospering considerably include banking—much money h passed between Germany and Russia on account of prisoners of war—and shipping.]

—— **Hydrografiska byrån Årsbok 5 för år 1913.** 263 pp. Maps, diagrs. Stoc holm, 1915. [Contains small maps of Sweden showing the following: rainfall, month and annual for 1913; accumulated snowfall on the first of each month from Oct. 1, 191 to May 1, 1913; duration of snow-cover during that winter; date of freezing and ope ing of lakes in the autumn of 1912 and spring of 1913; duration of freezing tempe ature in days.]

—— **Järnvägar, Statens, av Kungl. Järnvägsstyrelsen: År 1914.** 236 pp. Map diagrs., ills. *Sverges Officiella Statistik,* Stockholm, 1915. [Accompanied by a map southern Sweden, and one of the rest of the country, both 1:2,000,000, showing in col the ownership, gage, and stage of construction of its railroads.]

—— **Järnvägsstatistik, Allmän, av Kungl. Järnvägsstyrelsen: År 1913.** vii an 107 pp. Maps. *Sverges Officiella Statistik,* Stockholm, 1915. [Accompanied by simil maps to those of the 1914 edition, listed immediately above.]

Kolderup, C. F. **Jordskjælv i Norge i 1913.** 18 pp. Maps. *Bergens Museun Aarbok 1914-1915: Avhandlinger og Aarsberetning,* No. 3, Art. 16. [Earthquakes i Norway during 1913. Summary in German.]

Kolderup, C. F. **Jordskjælv i Norge i 1914.** 11 pp. Map. *Bergens Museun Aarbok 1914-1915: Avhandlinger og Aarsberetning,* No. 3, Art. 17. [Summary i German.]

—— **Norway, Trade and Commerce of, Report (Supplementary), for th Year 1913 on the.** 16 pp. *Diplomatic and Consular Reports,* Ann. Series, No. 553 London, 1915.

Oxaal, John. **Traenlandet.** Maps, diagrs., ills. *Norske Geogr. Selskaps Aarbo* Vol. 25, 1913-1914, pp. 55-101. [A discussion of the effect of marine erosion an glaciation on the rock structure of an archipelago off the Norwegian coast at the Arct Circle. A colored map, 1:400,000, showing the hypsometry and bathymetry of th Norwegian coast between 67° and 66° N. accompanies the paper.]

Rabot, Charles. **Le guerre et l'élevage du renne en Laponie.** Ills. *La Natur* No. 2207, 1916, Jan. 15, pp. 39-42.

Topografisk kort over kongeriket Norge. 1:100,000. Sheets: 9C, Skien; 15C, Fet; 26 Hamar. Norges Geografiske Opmaaling, [Christiania], 1914.

Landgeneralkart over Norge. 1:250,000. Blad LV, Kristiania. Norges Geografisk Opmaaling, [Christiania], 1915.

Austria-Hungary

Ampferer, Otto. **Verteidigung des interglazialen Alters der Höttinger Breccie** *Petermanns Mitt.,* Vol. 61, 1915, Sept., pp. 336-338. [The age of the Höttinger brecci which caps a limestone range north of Innsbruck, is a matter of controversy amon German geologists.]

Baschin, O. **Die österreichisch-ungarischen Küstenländer.** *Die Naturwissen schaften,* Vol. 3, 1915, No. 45, pp. 611-612. [Summary of a lecture by N. Krebs befor the Berlin Geogr. Society, Oct. 9, 1915.]

Gigante, Silvino. **A Velenceiek Fiuméban.** *A Tenger,* Vol. 5, 1915, No. 11-1 pp. 349-359. Hungarian Adriatic Assoc., Budapest. [On the Venetians in Fiume.]

Pfaundler, R. v. **Österreichisch-italienische Grenzfragen.** Map. *Petermann Mitt.,* Vol. 61, 1915, June, pp. 217-223. [The map accompanying this article is omitte from the copies of the journal sent outside of Germany, says a publisher's statement, an will be supplied after the war.]

Pfaundler, R. v. **Österreichisch-italienische Grenzfragen: [Nachtrag au Grund des neuen österreichischen Rotbuches].** Map. *Petermanns Mitt.,* Vol. 61 1915, Sept., pp. 333-335. [The map accompanying the same author's article in the Jun number of *Petermanns Mitt.,* listed above, serves as an illustration for this one also.]

Ravani, Luigi. **Pelagosa.** Bibliogr. *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 313-319 Novara. [Pelagosa, in Austrian possession, is one of a bridge of islands between th Dalmatian and Italian coasts.]

Wallner, Julius. **Beiträge zur Geschichte des Fischereiwesens in der Steier mark: Das Gebiet der Mur.** *Archiv für Fischereigeschichte,* 1915, April, No. 5, p 47-103; Oct., No. 6, pp. 55-156. Berlin.

BALKAN STATES, INCLUDING RUMANIA

WACE, A. J. B., AND M. S. THOMPSON. **The Nomads of the Balkans: An Account of the Life and Customs Among the Vlachs of Northern Pindus.** x and 332 pp. Ills., index. E. P. Dutton & Co., New York, 1913. $5. 9 x 6.

This study has neither literary form, imagination, nor unique data to hold one to its reading. There is no reason why ethnic data should not be presented in an interesting manner. The authors spent the summers of 1910 and 1911 among the Vlachs, the nomads of the Balkans; so they did not lack knowledge, but they failed to present "human interest."

The Vlachs are scattered in limited bands over their native lands. They are pastoral rather than agricultural and spend their winters with their flocks and herds on the plains, returning to their mountain villages with the green pastures of spring. They extend in isolated areas from the Adriatic to the Aegean Sea. Near the Adriatic they are found from Durazzo in the north to Avlona in Albania in the south. They extend intermittently eastward over Greece, northward over southern Serbia, and still farther northeastward into Bulgaria. Undoubtedly Vlachs are today in arms in all those countries. Their young men have been migrating to the United States in considerable numbers since 1908.

The most interesting thing brought out by the authors is the origin and history of the Vlachs. The people call themselves "Aromuni," or Romans. Their language, both in vocabulary and structure, is undeveloped Latin. Now, who are the Vlachs—descendants of Roman colonists, or Romanized tribes of the Balkan area? As early as the sixth century A.D. Procopius recorded a list of fortified Balkan towns having Vlach names, though the language was not written until the eighteenth century. About 976 A.D. the Vlachs were again spoken of in written history; near the close of the twelfth century they came into prominence. In 1192 they routed the Byzantine army and nearly captured the Emperor. From 1196 until 1207 Johanizza was sole king of the Vlachs and the Bulgarians; the Greeks were his allies. Two neighboring Vlachian kingdoms flourished until the fourteenth century. Great Vlachia ceased to exist in 1308, and Little Vlachia was conquered by the Serbians in 1350. Since that date the scattered Vlachs have lived among the various dominating nations which have held their territory. They are only slowly being amalgamated and assimilated. It is believed that the Vlachs are mainly "the descendants of Romanized hill tribes rather than of actual Roman colonists, who would long since have been absorbed by the other town-dwelling races, and in particular the Greeks"—who everywhere in the Near East, where Roman and Greek have met, have absorbed the Roman.

A. E. JENKS.

—— **Cyclades, Trade and Commerce of the, Report for the Year 1914 on the.** 21 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5537. London, 1915.

TEDESCHI, E. C. **L'espansione economica italiana in Balcania.** *Riv. Coloniale*, Vol. 10, 1915, No. 6, pp. 305-315. Rome.

WEISS-BARTENSTEIN, W. K. **Bulgariens Handelsbeziehungen zu seinen Nachbarstaaten.** *Weltwirtschaft*, Vol. 5, 1915, No. 9, pp. 184-187. Berlin.

Sketch map of the southern Balkans [showing] principal Vlach areas. 1:2,050,000. Accompanies, opp. p. 206, "The Nomads of the Balkans," by A. J. B. Wace and M. S. Thompson, E. P. Dutton & Co., New York, [1913]. [Book reviewed above.]

SPAIN, PORTUGAL

BECERRA, L. L. **Osma: Monografía geográfica.** *Bol. Real Soc. Geogr.*, Vol. 12, 1915, No. 10, pp. 377-400. Madrid. [Osma is an old Moorish town in north-central Spain in the province of Soria.]

BUEN, ODÓN DE. **El valle del Lozoya: Extracto de la monografía geólogica publicada por D. Lucas Fernández Navarro.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 12, 1915, No. 11-12, pp. 459-463. Real Soc. Geogr., Madrid.

CHICO Y RELLO, PEDRO. **Zamarramala: Monografía geográfica.** Map, ills., bibliogr. *Bol. Real Soc. Geogr.*, Vol. 12, 1915, No. 9, pp. 337-361. Madrid. [Zamarramala is a small town near Segovia.]

—— **Corunna, now Vigo, Consular District of (Comprising the Provinces of the Asturias, Leon, and Galicia), Trade and Industries of the, Report for the Year 1914 on the.** 42 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5563. London, 1916.

—— **Lisbon, Consular District of, Trade of the, Report for the Year 1914 on the.** 28 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5514. London, 1915.

—— **Oporto, Consular District of, Trade of the, Report for the Year 1914 on the.** Map. 17 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5536. London. 1915.

SPRAGUE, R. L. **Gibraltar.** 6 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 20a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Mapa Militar Itinerario de España, 1:200,000: Hojas 24, 39 and 94. Depósito de la Guerra, [Madrid], 1914 and 1915.

[Province of] Ávila. 1:425,000. Alberto Martin, Editor, Barcelona, [1915].

[Province of] Granada. 1:500,000. Alberto Martin, Editor, Barcelona, [1916].

[Province of] Lugo. 1:400,000. Alberto Martin, Editor, Barcelona, 1915.

[Province of] Madrid. 1:400,000. Alberto Martin, Editor, Barcelona, [1915].

[Province of] Santander. 1:350,000. Alberto Martin, Editor, Barcelona, [1915].

[Province of] Sevilla. 1:500,000. Alberto Martin, Editor, Barcelona, [1915].

Plano de Almeria, revisado por el Ayuntamiento y facilitado por D. Gabriel Pradal Ruiz. 1:7,500. Alberto Martin, Editor, Barcelona, [1916].

Plano de Málaga, revisado por el Ayuntamiento y corregido por Manuel Zafazár. 1:7,500. Alberto Martin, Editor, Barcelona, [1915].

Plano de Murcia, facilitado por D. Pedro Garcia Faria. Revisado por el Ayuntamiento. 1:5,000. Alberto Martin, Editor, Barcelona, [1915].

Plano de Pamplona, facilitado y revisado por el Ayuntamiento. 1:4,500. A. Martin, Editor, Barcelona, 1915.

AFRICA

ATLAS REGION

BLAKE, MAXWELL. **Morocco.** 5 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 75a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

CAMBON, VICTOR. **Les grands travaux au Maroc et l'Exposition de Casablanca.** Map, ills. *La Nature,* No. 2208, 1916, Jan. 22, pp. 49-53. [French development of Morocco since the war began.]

KEMP, E. C. **Tunis.** 4 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 79c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

ONTIVEROS, J. G. **El distrito consular de Mazagán: Reformas y modificaciones de que ha sido objecto desde 1912.** *Rev. de Geogr. Colon. y Mercantil,* Vol. 12, 1915, No. 11-12, pp. 421-453. Real Soc. Geogr., Madrid. [Spanish consular report dealing with commercial reforms introduced by the French régime in Morocco.]

—— **Tangier, Consular District of, Trade of the, Report for the Year 1913 on the.** 56 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5559. London, 1916. [The prospective internationalization of Tangier improved trade by bringing thither an influx of money and Europeans, though fighting in the adjacent Spanish zone cut off much interior trade. Tangier was spared attack because—it is said—the most powerful hill tribe receive their supplies from it and declared it sacred.]

SUDAN AND UPPER GUINEA

AYMERICH, GÉNÉRAL. **La conquête du Cameroun.** *L'Afrique Française,* Vol. 25, 1915, No. 10-12, pp. 309-315. [Contains material of geographic interest.]

F., J. **La conquête du Cameroun septentrional.** Map, diagr., ills. *L'Afrique Française,* Vol. 25, 1915, No. 10-12, pp. 279-289. [Contains material of geographic interest.]

—— **Guinea, Spanish Possessions in the Gulf of, Trade of the, Report for the Year 1914 on the.** 9 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5519. London, 1915.

HUBERT, HENRY. **Les séismes en Afrique occidentale française.** Map. *La Géogr.,* Vol. 30, 1914-15, No. 5, pp. 359-364. Paris.

JOSEPH, GASTON. **Villes d'Afrique: Bondoukou.** *Renseign. Colon.* (*Suppl. à l'Afrique Franç.*), 1915, No. 10-12, pp. 202-206. [Bonduku lies in the French Ivory Coast near the boundary of the British Gold Coast colony.]

MARTIN, CAMILLE. **Togo et Cameroun: Formation et composition territoriales.** Maps. *Renseign. Colon. (Suppl. à l'Afrique Franç.)*, 1915, No. 10-12, pp. 177-202. [Summary of the physical and economic geography.]

WESTERMANN, DIEDRICH. **Vier Monate in Liberia: Ein Besuch in Boporu und Medina.** *Kolon. Rundschau*, 1915, No. 11-12, pp. 559-565. Berlin.

EAST AFRICA

RAVA, MAURIZIO. **Al Lago Tsana (il mar profondo d'Etiopia): Relazione del viaggio compiuto dalla Missione Tancredi per incarico della Reale Società Geografica.** Con un'appendice di geografia agronomica del Cav. Giuseppe Ostini. viii and 270 pp. Maps, ills., index. Reale Società Geografica, Rome, 1913. Lire 5. 10 x 7.

A varied miscellany of travel is presented in this account of the Tancredi Mission to the heart of mountainous Abyssinia. The trip was undertaken under the auspices of the Royal Italian Geographical Society. Although this country has been the favorite tramping ground of Italian explorers in recent years, it was reserved for the author to accomplish the first circuit on land of the shore of Lake Tsana. A flowing narrative style takes the reader day by day along the successive stages of the journey. Two phases of observation appear to have attracted the author particularly. He dwells lengthily on the Abyssinians and their customs, as well as on the resources of their territory. Taken together, the pages of the book give a good idea of the belt of land extending immediately southwest of Eritrea to the sources of the Blue Nile. Its want of method, however, is the book's main defect. Systematic presentation might be expected, inasmuch as four years elapsed between the return of the expedition and the printing of the book.

An appendix by G. Ostini on the agricultural resources is an instructive summary of the economic conditions which prevail in the lowlands—once also lake-beds—surrounding the lake.

—— **Uganda: Report for 1914-15.** 23 pp. Map. *Ann. Colonial Repts., No. 873.* London, 1916.

ASIA

TURKEY IN ASIA, ARABIA, CAUCASIA, IRAN

WILD, L. H. **Geographic Influences in Old Testament Masterpieces.** xiii and 182 pp. Map, index. Ginn & Co., New York, 1915(?). $1.00. 7½ x 5½.

This attractive little volume is a good example of the way in which the modern geographical viewpoint is gradually leavening all branches of human thought. In teaching her Bible classes Miss Wild found that a knowledge of geographic influences in Palestine was essential. She was impressed by the fact that scores of the finest Biblical passages are in a large measure geographical descriptions. Therefore she read the best books on the geography of Palestine and then boiled them down to fit her classes.

The first chapter is a condensed but clear picture of the main features of the country, brightly written and easy to grasp, but characterized by enthusiasm rather than by scientific accuracy. Then follow a series of chapters on the coast, the roads, the hills, the attractions of the plain, Mount Carmel and the rains, the thunderstorm psalm, and similar subjects. The chapter entitled ''Naaman's Scorn of the Jordan'' illustrates Miss Wild's method. She brings out the simple artlessness of the story, the sharp contrast between the clear Abana and the muddy Jordan, the unusualness of such a visit as that paid by Naaman to Elisha. Then she lets the Bible tell its own story, but the reader sees the geographical setting much better because of what has gone before. Each chapter is provided with half a dozen references to some of the best and most easily accessible books by scholars who have known the country at first hand.

ELLSWORTH HUNTINGTON.

—— **Bahrein Islands, Trade of the, Report for the Year ending March 31, 1915, on the.** 26 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5555. London, 1916.

BAIKIE, JAMES. **The Cradle of Civilization: The Historic Lands Along the Euphrates and Tigris Rivers Where Briton Is Fighting Turk.** Ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 2, pp. 127-162.

BASCHIN, O. **Reisen im nördlichen Kleinasien.** *Die Naturwissenschaften*, Vol. 4, 1915, No. 50, pp. 670-672. [Abstract of a lecture by R. Leonhard before the Berlin Geographical Society, Nov. 6, 1915.]

Clay, A. T. **Pushing Back History's Horizon: How the Pick and Shovel Are Revealing Civilizations That Were Ancient When Israel Was Young.** Map, ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 2, pp. 162-216. [Archeological research in Babylonia and Assyria; wealth of excellent photographs.]

Cruzet, V. **L'Arabie et le peuple arabe avant l'avènement du prophète Mohammed.** *Bull. de la Section Tunisienne, Soc. de Géogr. Comm. de Paris,* 1913-14, No. 4, pp. 122-166.

—— **Economische toestanden in het Turksche Rijk.** *Tijdschr. voor Econ. Geogr.,* Vol. 6, 1915, No. 11, pp. 444-452. The Hague.

Geere, H. V. **Lower Mesopotamia.** *United Empire,* Vol. 7, N. S., 1916, No. 1, pp. 16-26.

Indelli, Paolo. **La Cilicia (il Vilayet di Adana).** 79 pp. *Direz. Gen. degli Affari Commerciali* [*Publ.*] *No. 13.* Minist. degli Affari Esteri, Rome, 1915.

M[artel], E. A. **Alexandrette et le chemin de fer de Bagdad.** Map, ills. *La Nature,* No. 2206, 1916, Jan. 8, pp. 31-32.

Michell, R. L. N. **Cyprus To-day.** *United Empire,* Vol. 7, N. S., 1916, No. 1, pp. 60-75. [Development of the island is bound up with agricultural reform; in the first place, with progress in irrigation.]

—— **Seistan and Kain, Districts of, Trade of the, Report for the Year Ending March 20, 1914, on the.** 22 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5539. London, 1915.

[Five maps of Bible Lands]: 1, Composite map of Bible Lands and North America; 2, Physical and political map of Bible Lands; 3, History map of Bible Lands; 4, Palestine elevations; 5, Palestine towns. Each 8 x 12 in. Scribner's Sons, New York, 1915.

China

—— **Chefoo, Trade of, Report for the Year 1914 on the.** 13 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5547. London, 1915.

—— **Hankow, Trade of, Report for the Year 1914 on the.** 12 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5551. London, 1916.

Jameson, J. P. **The Newly Opened Commercial Port of Pukow.** *Commerce Repts.,* 1916, No. 13, pp. 218-219. Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C., 1916. [Abstracted in the March *Review,* p. 221.]

Kinnosuke, Adachi. **China's Vast Resources: How Japan and America Can Co-operate to Aid in Chinese Development.** *Amer. Review of Reviews,* Vol. 53, 1916, No. 2, pp. 210-213.

Laufer, Berthold. **The Diamond: A Study in Chinese and Hellenistic Folk-Lore.** 75 pp., index. *Field Museum of Nat. Hist. Publ. 184* (*Anthropol. Series,* Vol. 15, No. 1). Chicago, 1915. [A phase of the influence of Western civilization on the Far East in classical times.]

Legendre, A. F. **Enquètes économiques en Chine: Les grands ports de la Chine; Le chemin de fer du Yunnan.** *Bull. Soc. de Géogr. Comm. de Paris,* Vol. 37, 1915, No. 10-12, pp. 273-283.

—— **Mengtzu, Trade of, Report for the Year 1914 on the.** 5 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5541. London, 1915.

Sherfesee, W. F. **The Reforestation Movement in China.** Ills. *Amer. Forestry,* No. 263, Vol. 21, 1915, Nov., pp. 1033-1040. [See abstract in the Geographical Record in this number under "Reforestation in China," pp. 301-302.]

Simpson, T. H. **Restoring China's Forests: A New American Influence in the Empire.** Ills. *Amer. Review of Reviews,* Vol. 53, 1916, No. 3, pp. 337-340.

—— **Trade, Returns of, and Trade Reports, 1914. Part 2: Port Trade Statistics and Reports. Vol. 4: Southern Coast Ports (Santuao to Pakhoi).** pp. 885-1266. *China Maritime Customs, Statist. Series, Nos. 3 and 4.* Shanghai, 1915.

—— **Tsinan and Tsingtau, Trade of, Report for the Year 1914 on the.** 6 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5517. London, 1915. [The report is unstatistical, as no trade figures are available.]

—— **Wuchow, Trade of, Report for the Year 1914 on the.** 11 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5499. London, 1915.

Plan of Chinkiang Harbour. 1:24,000. Accompanies "Yangtze Ports," being Vol. 2 of Part 2, *Port Trade Statistics and Reports.* Statistical Dept. of Inspector General of Customs, Shanghai, 1915.

Farther India, including Burma

Bovo, Goffredo. **Il commercio del Siam, dal 1° aprile 1914 al 31 marzo 1915.** 9 pp. *Direz. Gen. degli Affari Commerciali* [*Publ.*] *No. 14.* Minist. degli Affari Esteri, Rome, 1915.

Briggs, L. P. **French Indo-China.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 54c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Dreier, C. L. **Straits Settlements.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 56d. Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Maurizio, Piscicelli. **Nel Cambodge.** Ills. *Boll. Reale Soc. Geogr.*, Vol. 4, 1915, No. 9, pp. 959-985. Rome.

Moorhead, M. K. **Burma.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 50a, pp. 18-24. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Saigon, Trade of, Report for the Year 1914 on the.** 18 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5538. London, 1915.

—— **Senggora [Siam], Consular District of, Trade and Commerce of the, Report for the Year April 1, 1913, to March 31, 1914, on the.** 13 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5447. London, 1915.

Commission de délimitation de la frontière entre l'Indo-Chine et le Siam, 1907-8. 5 secteurs. 1:200,000. Service Géographique de l'Indo-Chine, [Hanoi], 1907-9.

Commission de délimitation entre l'Indo-Chine et le Siam. Sheets: Bassac, Dangrek, Grand Lac, Haute Mé-Nam, Khong, Mg. Khop-Mg. Xieng Lom, Mg. Krat, Mg. Nan, Nam Heung, Pak-Lay, Phnom Coulen. 1:200,000. H. Barrère, Editeur-Géographe, Paris, [1907?].

AUSTRALASIA AND OCEANIA

Melanesia, Micronesia, Polynesia

Daly, R. A. **Problems of the Pacific Islands.** Maps, diagrs., ills. *Amer. Journ. of Sci.*, Vol. 41, 1916, Feb., pp. 153-186. [Abstracted in this number on p. 303.]

Jaggar, T. A., Jr. **Activity of Mauna Loa, Hawaii, December-January, 1914-15.** Map, diagrs., ills. *Amer. Journ. of Science*, Vol. 40, 1915, Dec., pp. 621-639. [See abstract in the March *Review*, pp. 222-223.]

MacCurdy, G. G. **Race in the Pacific Area, with Special Reference to the Origin of the American Indians: Antiquity of Occupation.** *Amer. Anthropologist*, Vol. 17, 1915, No. 4, pp. 708-711.

Mayer, A. G. **The Islands of the Mid-Pacific.** Map, diagrs., ills. *The Scientific Monthly*, Vol. 2, 1916, No. 2, pp. 125-148. [Abstracted in this number, pp. 303-304.]

—— **New Caledonia, Trade, etc., of, Report for the Year 1914 on the.** 14 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5533. London, 1915.

—— **Society Islands, Trade and Commerce of the, Report for the Year 1914 on the.** 12 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5552. London, 1916. [The war is responsible for a degree of improvement in the cultivation of Tahiti. Many Chinese traders arriving there and finding no opening for their usual business offered themselves as laborers or started small plantations on their own account.]

POLAR

Antarctic

Mossman, R. C. **On a See-Saw of Barometric Pressure, Temperature, and Wind Velocity between the Weddell Sea and the Ross Sea.** Map. *Proc. Royal Soc. Edinburgh*, Vol. 35, 1914-1915, Part 2, pp. 203-216.

The author is an authority on Antarctic meteorology. He has lately been devoting himself especially to a study of the correlations which exist between seasonal meteorological conditions in different parts of the world, with particular reference to the Antarctic area. That the whole atmospheric system, of the so-called "permanent" areas of high and low pressure and of the prevailing winds, should be geared in together, like the cog-wheels of a great machine, is in no way surprising. The only surprising thing is that attention has only recently been drawn to this important aspect of world meteorology.

The data relate to the years 1902, 1903, 1911, and 1912, and were derived from Scott's two expeditions, the Scottish National Antarctic Expedition, the Argentine Meteorological Office, the Nordenskjöld Expedition, and the German South Polar Expedition. A pronounced see-saw in the case of pressure and wind velocity at all seasons of the year seems to be established between McMurdo Sound (Ross Sea) and Laurie Island, South Orkneys. The temperature results, except in winter, are indefinite. The inquiry has been extended outside of the special areas under investigation with a view to ascertaining whether there are any seasonal correlations between McMurdo Sound and other places in adjacent latitudes of the southern hemisphere. Seasonal contrasts seem to exist between the Ross Sea and parts of West Australia, New Zealand, and southern South America.

Investigations of this kind are not only extremely interesting in themselves but they have a much larger importance because of the possibility which they suggest, in the future, of long-range forecasts. Of course, Antarctic meteorological data are rather discouragingly fragmentary, and therefore they do not yet lend themselves to the most satisfactory use. But we need just such painstaking work as Mr. Mossman is doing to emphasize the need of fixed observatories in high southern latitudes. R. DEC. WARD.

LEVICK, G. M. **Natural History of the Adélie Penguin.** Ills. *British Antarctic Expedition, 1910, Natural History Report: Zoology,* Vol. 1, No. 2, pp. 55-84. British Museum, London, 1915.

WORLD AS A WHOLE AND LARGER PARTS

BROWN, W. C., AND P. H. JOHNSON. **The Home of Man. Part 3: America.** (Series: The New Outlook Geography.) 282 pp. Maps, ills., index. G. G. Harrap & Co., London, 1914. 1s. 9d. 7½ x 5½.

This is one of a series covering various parts of the earth as the "Home of Man." The principal countries of North and South America are discussed in detail. From the number of questions interspersed with the subject-matter one judges that the book is intended as a text for elementary schools. Many of the questions are good because they are developmental in character. On the other hand, they are so arranged as to disturb continuity of thought, a factor, it would seem, very desirable for children.

Maps are frequent but not always good. The characteristic English black-and-white is used, with parallels and meridians lacking. The rather inaccurate abbreviations of the names of states upon the maps of the United States seem almost without excuse. The rainfall map of North America on pages 53 and 54 and the map on page 55 showing storm tracks in the United States could be more accurate. The map on page 110 entitled "Transcontinental Routes of British North America" leaves the impression that Duluth is in Canada. In the chapter on the History of North America, all too brief, the maps lack physical features and hence lose very much of their intended value.

With careful revision the book would have much greater value.

EUGENE VAN CLEEF.

BUNTING, W. L., AND H. L. COLLEN. **A Geography of the British Empire.** 159 pp. Maps, ills., index. University Press, Cambridge, 1913. 10 x 7½.

The authors say that "this book is intended for the use of higher classes in [English] Preparatory Schools." The first part gives briefly some of the fundamental subjects of physical geography, and map reading. The authors have not intended to lay much stress on these subjects, for they write, "the early part makes no pretense at fullness but is to be regarded as the minimum of introduction to an elementary work of this kind." It is expected that the teacher will supplement the outlines given by illustrations of his own selection. The geography of the British Empire is considered, of course, in an elementary manner. The physiographic control over life and the development of the empire are discussed. Throughout the book geographical questions are asked which the pupil himself must solve. A good atlas is to be used with the text. There are numerous photographic illustrations and maps and diagrams in black and white. WILBUR GREELEY BURROUGHS.

NEWBIGIN, M. I. **The British Empire Beyond the Seas: An Introduction to World Geography.** xii and 351 pp. Maps, diagrs., index. G. Bell & Sons, London, 1914. 3s. 6d. 7½ x 5.

A book for pupils who have both a rudimentary knowledge of world geography and a somewhat more detailed knowledge of the geography of the British Isles. The author says that, within the limits of the time usually available in school, it is impossible to treat world geography as a whole in any detail; but if pupils are allowed to leave school with no knowledge of detail save in the case of the British Isles, they will have missed a very large part of the value to be obtained from geography. Because the British Empire contains types of practically all varieties of climate, surface, and modes of land utilization, the author treats the subject in such a manner that the pupil may acquire a knowledge of the conditions and principles of world geography by studying the British Empire. The relation of the inorganic to the organic is emphasized throughout.

The first part deals with the climate and cultivated plants of the empire; in the second part are considered those portions of the empire having cool or cold winters, warm summers and mild winters, hot regions with little native cultivation, hot regions with extensive native cultivation. Maps, diagrams, etc., are numerous. The book is well and interestingly written. WILBUR GREELEY BURROUGHS.

PHYSICAL GEOGRAPHY

GEOLOGY AND GEOMORPHOLOGY

REINECKE, LEOPOLD. **Average Regional Slope, a Criterion for the Subdivison of Old Erosion Surfaces.** 20 pp. Map, diagrs., ills. Reprinted from *Journ. of Geol.*, Vol. 24, 1916, No. 1. [Cover incorrectly gives 1915.]

It would be a great help in cases of disputed interpretations of old surfaces of erosion if the investigators presented at least the facts of slope declivity, for in such cases it is often not so much a question of the actual form as the stage in the erosion cycle which the form denotes. The Interior Plateau of British Columbia is at the present time in a very interesting stage of investigation. Nearly a half dozen interpretations have been made of the meaning of its erosion forms, but no one has hitherto presented the actual facts concerning the regional slopes of the province and their bearing on the possible interpretations.

The old upland surface of the Interior Plateau is obviously the product of a long erosion cycle. Its average slopes, measured from the higher areas of ridges between main drainage lines, vary from 150 to over 300 feet to the mile. The word ''slope'' in this case means the percentage of vertical to horizontal distance. For this investigation profiles, drawn in the direction of the main drainage lines and at right angles to them, assisted in determining whether the landforms are the result of one or more cycles of erosion, whether other than normal processes shaped the forms, and whether tilting or warping has taken place since the main erosion features were formed. It is argued that the criteria of plane-like surfaces, that is, the generally even sky-line, may exist in a surface whose detailed surfaces run from 100 to 300 feet to the mile; but they may be caused merely by the merging of several ridge lines of entirely different elevation in the observer's line of sight. Those unseen portions of the ridges which fall below the sky-line may have considerable declivity. It is also emphasized that the structure and topography are discordant not only in the case of the peneplain but also in the case of land surfaces in a late stage of development. This, however, is not a new conclusion. It has been pointed out before and is generally accepted by physiographers. The author suggests (1) that the term ''peneplain'' be restricted to surfaces with average slope of less than two per cent—that is, 105 feet to the mile—and (2) that surfaces of steeper gradient be referred to as ''beveled hills,'' though it is doubtful whether so crude a phrase will gain general acceptance.

The paper is marred by the absence of some important acknowledgments.

DAVISON, CHARLES. **The Naming of Earthquakes.** *Nature*, No. 2412, Vol. 96, 1916, Jan. 20, p. 566.

HOLMSEN, GUNNAR. **Om jordlags langsomme glidning, solifluktion.** Diagr., ills. *Norske Geogr. Selskaps Aarbok*, Vol. 25, 1913-14, pp. 25-41. Christiania. [On solifluction.]

LEITH, C. K., AND W. J. MEAD. **Metamorphic Geology: A Text-Book.** xxiii and 337 pp. Diagrs., ills., index. Henry Holt & Co., New York, 1915. $2.50. 8½ x 6.

MONTESSUS DE BALLORE, F. DE. **A Problem in Seismological Geology: On the Seismogenic Influence of Parallel Shelf-Faults.** Maps, diagrs. *Bull. Seismolog. Soc. of Amer.*, Vol. 5, 1915, No. 3, pp. 150-154. [By ''parallel shelf-faults'' are meant the faults enclosing a rift valley. The Rhine *graben* between Basel and Mainz and the Erythrean rift valley are selected for discussion.]

METEOROLOGY AND CLIMATOLOGY

PENCK, ALBRECHT. **Die Formen der Landoberfläche und Verschiebungen der Klimagürtel.** *Sitzungsber. der Kgl. Preussischen Akad. der Wiss.*, 1913, No. 4, pp. 77-97. (Abstract in: EDUARD BRÜCKNER, **Albrecht Penck über die Verschiebung der Klimagürtel in der Quartärzeit.** Map. *Zeitschr. für Gletscherkunde*, Vol. 9, 1915, No. 4, pp. 276-283.)

PENCK, ALBRECHT. **The Shifting of the Climatic Belts.** Map. *Scottish Geogr. Mag.*, Vol. 30, 1914, No. 6, pp. 281-293.

In these two recent articles Professor Penck has advanced the hypothesis that climatic changes are due primarily to a shifting of climatic zones alternately equatorward and poleward. He apparently applies this hypothesis not only to the Glacial Period but to historic changes such as the ''period of extreme dryness'' of which ''there are . . . many indications . . . some centuries after the beginning of the Christian era.'' The basis for this hypothesis is the contrast between the salt lakes, sand dunes, and general conditions on the poleward and equatorward sides of the great desert belts. For instance, Lake Chad on the equatorward side of the northern dry belt has the appearance of a newly formed lake which has not yet become highly saline and is still in process of enlargement, although it fluctuates greatly from decade to decade. The Dead Sea on the other side of the belt shows abundant evidences that it has long been diminishing in spite of its fluctuations. It is intensely salt and is surrounded by a large number of strands proving that the level has fallen. The lakes around Mexico City resemble Chad and present the same contrast with Great Salt Lake that Chad presents with the Dead Sea. Such facts ''point to variations in climate, to increase of aridity on the polar side, to increase of humidity on the equatorial side. . . . Very characteristic are the phenomena of the Sahara. In the north there are living dunes consisting of wind-blown sand; the dead dunes, however, covered by sparse vegetation, are confined to the south, and these dead dunes stretch beyond the arid region far into the humid zone along the right bank of the Niger.'' In the same way on the equatorward side of the Kalahari Desert the dunes are dead and fixed, indicating that in the last few thousand years there has been an expansion of the area of tropical rains.

''All this leads us to assume that the area of extreme aridity in Africa once lay much nearer the equator than it does today, exactly as was the case in both Americas, and guided by the phenomena of the Great Basin we may fix this period in the Ice Age. The great Ice Age presents itself, then, neither as a period of extreme cold—as was originally held—nor as a period of excessive humidity over the whole earth, but as a period during which the climate belts of the world lay some four or five degrees nearer the equator, while the snow-line was found more than 3,300 feet lower. . . . The shifting of the climate belts, however, has never gone so far that one belt has entirely usurped the position of another.'' As a result of this some areas have grown drier and some have grown moister, while between them there have been relatively constant regions.

Penck's hypothesis of the shifting of climatic zones is identical with one reached independently and on wholly different grounds by the reviewer, whose conclusions were first published in an article on ''The Shifting of Climatic Zones in Mexico'' in the *Bulletin* of this Society in 1913 (Vol. 45, pp. 1-12 and 107-116). They were amplified in ''The Climatic Factor,'' 1914, and in the *Bulletin of the Geological Society of America*, Vol. 25, 1914, pp. 477-590. The matter is so important that it is worth while to quote from ''The Climatic Factor'' a few words which were written before the reviewer had heard of Penck's hypothesis and which therefore strengthen the hypothesis by showing that different lines of study lead to the same conclusion. ''Changes of climate are probably characterized by the shifting of the world's great climatic zones from north to south and the reverse'' (p. 4.) . . . . ''During the past 2,000 to 3,000 years . . . . the general shifting seems to have carried the conditions of more southerly regions into those farther north. This would mean that at the beginning of the Christian era or earlier the zone of westerly storms, during the winter but not necessarily in summer, lay farther south than today, and thereby made the present subtropical zone less arid than at present. The natural corollary of this would be that the subtropical zone of aridity was also displaced southward. This would have led to a diminution of winter rainfall and hence of vegetation along the northern edge of the equatorial zone. . . . Thus jungle would have been caused to take the place of genuine, dense forests,'' (p. 190) and the Mayas of Central America would have been able to exist and flourish, although now their great ruins are in a region where progress is practically impossible because of the dense vegetation and devastating tropical diseases.

Penck attempts to explain the equatorward shifting of climatic zones during the Glacial Period by a lowering of terrestrial temperature, ''which would bring about not only an advance in the snow-line, but at the same time a shifting of all the climatic belts equatorwards. If the heat supply of the earth decreases, the atmospheric circulation will become less intense. The great areas of high pressure will become weaker and the horse latitudes must move toward the equator. And it is they that determine the position of the arid areas upon the land masses. Thus everything points to the fact that the . . . . climate of the Ice Age was a period of reduced heat supply.''

This last conclusion is open to question. Köppen and Newcomb have shown beyond the possibility of doubt that at times of many sunspots the earth's surface is cooler than normal (see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 184-189). The work of Arctowski, Bigelow, Kullmer, and others shows with almost equal certainty that at such times the activity of the atmospheric circulation is greater than usual. The measurements of solar radiation by Abbott and others show that when sunspots are numerous the sun furnishes a heat supply greater than usual. Moreover, Hobbs has made it clear that today continental glaciation in Greenland and Antarctica is accompanied by markedly high atmospheric pressure. An increase of the extent of the glaciated areas would inevitably be accompanied by an increase in the size and intensity of the areas of high pressure. Thus there is good ground for thinking that instead of being a period of decreased heat supply, weaker barometric gradients, and gentler winds, as Penck's supposition demands, the Glacial Period may actually have been a time of increased heat supply, which gave rise to stronger barometric gradients, stronger winds, a consequent invasion of the more equatorial climatic belts by those lying toward the poles, and finally a greater removal of heat from the earth's surface by convection both at the equator and to a less degree farther poleward. If this supposition is true we may accept Penck's hypothesis of a shifting of zones but not his explanation of the cause. It seems probable that the shifting has been much more complicated than would appear at first sight, for the areas of continental and oceanic pressure as well as the general zones of climate enter into the problem. ELLSWORTH HUNTINGTON.

GALÁN, ANTONIO. **Climatic Fluctuations During the Historic Epoch.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 608. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HERRMAN, C. F. VON. **Position of Meteorology Among the Sciences.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 609. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HUMPHREYS, W. J. **Wind Velocity and Elevations.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 609. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HUNTINGTON, ELLSWORTH. **Solar Activity, Cyclonic Storms, and Climatic Changes.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 609. [Abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

PETTERSSON, O. **Climatic Variations in Historic and Prehistoric Time.** 26 pp. Maps, diagrs., ills. Reprinted from *Svenska Hydrogr. Biol. Kommiss. Skrifter*, No. 5, 1914. [Extended comment will be found in the article by Ellsworth Huntington on ''Climatic Variations and Economic Cycles'' in the March *Review*, pp. 192-202.]

TALMAN, C. F. **Meteorology and Seismology at the Pan American Scientific Congress.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 605-606. [Lists the papers read and is followed by selected abstracts of some of them. The titles of the majority of the abstracted papers are listed in this number in their respective places.]

THIEME, B. **Funkentelegraphische meteorologische Stationen.** Ills. *Meteorol. Zeitschr.*, Vol. 32, 1915, No. 10, pp. 449-460.

—— **Verandering van het klimaat in historischen tijd.** *Vragen van den Dag*, Vol. 21, 1916, No. 1, pp. 88-89.

ECONOMIC GEOGRAPHY

CLUTE, R. L. **Practical Lessons in Tropical Agriculture: Book I.** x and 228 pp. Ills., index. World Book Co., Yonkers, N. Y., 1914. 60 cents. 7½ x 5½.

At first thought, one would not expect the textbook that approaches an ideal to originate in the Philippines; yet this is precisely what has happened. This volume is one of the most teachable texts in recent years. Part I is entitled ''The Plant and Its Parts'' and Part II, ''Practical Applications of the Laws Governing Plant Life.'' In every instance the illustrations used for applying principles are taken from the Philippines and not from faraway lands. At the end of the chapters are exercises and questions which are good, common sense. The diagrams are clear and well done, so that any student of average ability may easily understand them. The book is alive, expressions being fresh and crisp, thus avoiding a lag in the child's interest. One striking feature is that, in discussing the theoretical phases of plant life, applications are made to food plants instead of the customary flowering plants. Thus at every turn the reader is acquiring practical information. The appendix includes instructions for making a balance and a rain-gage; a bibliography; and a classification of the more important economic plants of the Philippines. The index, consistent with the rest of the text, is very complete and comprehensive. Eugene Van Cleef.

Boyer, Jacques. **Kapok—A New Textile Fibre: Its Manufacture and Industrial Applications.** Ills. *Sci. Amer. Suppl.*, No. 2094, Vol. 81, 1916, Feb. 19, pp. 120-121. [A method of utilizing the down of the silk-cotton tree that flourishes in Java and elsewhere in the tropics.]

—— **Cassava: Its Cultivation and Utilisation.** *Bull. Imperial Inst.*, Vol. 13, 1915, No. 4, pp. 581-611.

Descombes, Paul. **Reforestation and Occult Condensation.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 617-618. [Translated from the French original, published in *Comptes Rendus Assoc. Franç. pour l'Avanc. des Sci., 43me sess., Le Havre, 1914: Notes et Mém.*, pp. 337-341.]

Jagow, Kurt. **Der Hering im Volksglauben und in der älteren Forschung.** *Archiv. für Fischereigeschichte*, 1915, Oct., No. 6, pp. 213-247. Berlin.

Löfgren, Alberto. **A tamareira e seu cultivo.** 9 pp. Ills. *Inspectoria de Obras contra as Seccas Publ. No. 37.* Rio de Janeiro, 1912. [On the cultivation of the date-palm.]

McAdie, Alexander. **The Theory and Practice of Frost Fighting.** Diagrs., ills. *The Scientific Monthly*, Vol. 1, 1915, No. 3, pp. 292-301. [See abstract in the Feb. *Review*, p. 146.]

Moore, H. L. **Economic Cycles: Their Law and Cause.** viii and 149 pp. Diagrs. The Macmillan Co., New York, 1914. $2. 9 x 6. [Extended comment will be found in the article by Ellsworth Huntington on "Climatic Variations and Economic Cycles" in the March *Review*, pp. 192-202.]

Warburg, O. **Der Krieg und die koloniale Landwirtschaft.** *Der Tropenpflanzer*, Vol. 19, 1916, No. 1, pp. 1-24.

Williams, F. E. **Where Our Principal Minerals Come From.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 4, pp. 101-107.

HISTORY OF GEOGRAPHY AND EXPLORATION

Alexander, P. F., edit. **The North-West and North-East Passages, 1576-1611.** (Series: Cambridge Travel Books.) xx and 211 pp. Ills. University Press, Cambridge (G. P. Putnam's Sons, New York), 1915. 75 cents. 8 x 5½.

The series to which this volume belongs is intended to make available the records of geographical discovery. The present volume covers but a short period, thirty-five years, and is devoted to six attempts to penetrate the Northwest Passage and one attempt on the Northeast. It includes two voyages of Frobisher, three of Davis, one of Hudson (his last), and one of Barents (his third). These accounts are the original records as written by the explorers or one of their companions, spelling and punctuation only having been modernized. The tales thus left as originally reported are more valuable than any transcription could be and have also a charm and atmosphere which could not be transferred. Robert M. Brown.

Blaikie, W. G. **The Personal Life of David Livingstone, Chiefly from His Unpublished Journals and Correspondence in the Possession of His Family.** 508 pp. Map. Fleming H. Revell Co., New York, no date. 50 cents. 7½ x 5.

At the request of members of Livingstone's family Doctor Blaikie wrote this book to make the world better acquainted with the character of the great explorer, for in Livingstone's own books his modesty led him to say little of himself. Doctor Blaikie says: "Those who knew Livingstone best feel that little is known of the strength of his affections, the depth and purity of his devotion, or the intensity of his aspirations as a Christian missionary. The growth of his character and the providential shaping of his career are also matters of remarkable interest, of which not much has yet been made known." Even the history of Livingstone's African life is given more completely than in previous accounts, and many of the chapters contain material of which the public has known little or nothing.

Among the sources from which Doctor Blaikie has drawn intimate details of Livingstone's life are his unpublished journals, his correspondence with friends, and information furnished by relatives and friends, still living. The book makes an important addition to the works already published on this great missionary and Christian explorer.

Wilbur Greeley Burroughs.

THE
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A NEW LEWIS AND CLARK MAP

By ANNIE HELOISE ABEL, Ph.D.
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[With facsimile map, Pl. II, facing p. 344]

The possible—and, one might easily add, the almost inevitable—recovery of historical sources, even though they be lost for many years, finds no better illustration than in connection with the records of the great Lewis and Clark exploring expedition of 1804 to 1806. It is well known that President Jefferson, in making arrangements for that expedition, was insistent that careful and complete records of it, in detail, should be kept, and they were kept, yet Jefferson's purpose failed of logical fulfillment by reason of the fact that, in his time, they were never brought all together into one place and published. On the contrary, they became widely scattered, and some of them have never to this day been traced. In recent years, however, important finds have been made and reported. For example, when, in 1905, R. G. Thwaites published his excellent edition of such of the original journals as were then known for a certainty to exist, he had occasion to record the circumstances of the recovery of some of them, notably the Whitehouse diary. Last summer his eminent successor, Milo M. Quaife, had a similar task to perform,[1] he having, with the aid of others, relocated the long-lost Ordway narrative, which is shortly to appear in print under his editorship.[2]

Such recoveries as those of Thwaites and Quaife called, of course, the attention of historical scholars to the existence of various repositories of Lewis and Clark data and offered the suggestion that more might yet be found, and, as a matter of fact, another has been found and that within th last few months. The new repository is the U. S. Indian Office and, cor sidering that Clark was for so large a part of his life in direct connectio with that office, the wonder is that special students of the Lewis and Clar expedition never thought of it as a possibility before.

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[1] Cf. *Mississippi Valley Hist. Rev.*, June, 1915, pp. 108-109.

[2] After this study had been thoroughly well entered upon, it developed that Mr. Quaife, having heard that a Lewis and Clark map had been found in the U. S. Indian Office, had hopes of being able to reproduce it in conjunction with the Ordway Journal. The study was not abandoned, however, mainly for the reason that the Indian Office authorities wished it to proceed and were decidedly averse to having the map advertised as a Lewis and Clark map until after its identity had been satisfactorily established. Moreover, the present investigator felt that, since even a cursory examination showed the map to be a very valuable one historically, it was deserving of a more extended, specific, and individual treatment than it could possibly get were it to appear with the Ordway Journal, particularly as that was already in the hands of the printer.

The particular way in which the Indian Office is already proved to b a repository of Lewis and Clark data is in its possession of a manuscrip map that has recently come to light among its archives. This map, upo examination, reveals itself to be of such a character that it seems safe t contend that it must assuredly have constituted a very useful portion o the original Lewis and Clark equipment and is certainly not a thing heretc fore noted by either collectors or editors.

The map was found by H. M. Hamblin, M.D., a clerk in the Mail and Files Division of the Office of Indian Affairs, among some old Cen tral Superintendency "Accounts."[3] It was enclosed with other map and sketches[4]—all presumably once of Clark ownership[5]—in a wrappe bearing the following vaguely identifying superscription, or endorsement:

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[3] "Accounts," it should be explained, include, in Indian Office filing, "Estimates," "Property R turns," "Vouchers," and the like.

[4] The contents comprised:—

a. A tracing showing the Mississippi, the Missouri for a short distance above the Kansas, Lak Michigan, Superior, and Winnipeg, and then the country onwards to the Pacific. Towards the sout appear the "sources of Rio Norte according to De Lisle."

b. A rough sketch showing the Mississippi River from its junction with the Ohio to a little belo Memphis. On the west bank of the Mississippi, opposite the mouth of the Ohio, is "Spanish Guard, where customs were collected. Lower down is Fort Jefferson.

c. A rough sketch showing the Mississippi River from the Louisiana line, latitude 33° N., to Roc River and giving various Indian boundaries. The Cherokees are shown as living west of the Mississippi

d. A rough sketch of "Chipaway and Sioux Lines," showing Fort Snelling and a Sauk River encamp ment "after the peace made at St Peters 1821."

e. A rough sketch showing a part of the Kaw and Osage cessions of 1808 and 1825, with Fort Osage nea Fire Prairie and Cantonment Gibson located.

f. A rough sketch illustrative of certain phases of the Black Hawk War. Memoranda on the bac indicate the whereabouts of "Coles party" upon information furnished by Mr. Forsyth (Agent Thoma Forsyth ?) and give a list of "good" chiefs and one of "bad." At the top appears the name, "France Lesseur."

g. A plat of the survey of the Ioway and Sauk lands by W. S. Donohoe, surveyor, 1837.

h. A plan of fortifications, indeterminate.

i. A copy of a contemporary map with added details.

j. A census map of the region of the, "Bend of the Missouri, Long. 101° 25′—Lat. 47° 32′ by Mr Thomson . . . in 1798." On the outside of the map is written, "A sketch of the North Bend of the Missouri This belongs to Capn Lewis."

k. An incomplete tracing of the Missouri and Platte Rivers on a scale of 50 miles to the inch.

l. A "Sketch given by George Drewyer, 5th August, 1808," indicating "the road to the Spanish settle ments" and the "supposed" waters of the "Gulph of California," also the "establishment made b Manuel Lisa in October 1807" with the information communicated, apparently in Clark's handwriting that "from this establishment a man on horseback can travel to the Spanish country in 14 days—" (fo corroborative testimony on this point, see Coues's citation of Clark N125 in "History of the Expeditio under the Command of Lewis and Clark," Vol. 3, p. 1153, note 14.) In connection with the Manuel Lisa establishment, it is interesting to observe that Drewyer placed it where one of the Clark maps (*cf.* Coues Vol. 4, No. 2) placed it; that is, right in the fork of the Big Horn and Yellowstone Rivers. It will be note that Chittenden, contrariwise, placed it on the east bank of the Big Horn and the south bank of th Yellowstone (*cf.* "History of the Fur Trade of the Far West," Vol. 3, map). He further described it as "o the west bank of the river—just above latitude 46° N." (*ibid.*, p. 956). Apparently Chittenden confounde its location with the site of the Clark camp, July 26, 1806 (*cf* "Original Journals," Vol. 5, p. 296, and Vol. 8 map, No. 51).

[5] This is inferred from the fact that they all date from the period and relate to the region of Clark's official activities.

Retained[6]
Central Superin^{y}
Maps &c
of
Indian Country

The particular bundle of "Accounts" in which it was had no distinguishing marks, no special label, no office brief, no file notation.[7] In short, it had nothing whatever about it that would differentiate it from a thousand or more other such bundles or that would indicate ever so slightly how exceedingly interesting, not to say especially valuable, some of its contents might possibly be. Had it not happened, forsooth, to be the business of Dr. Hamblin to sort the "Accounts," the richly detailed Clark map, subject of this investigation and discussion, might easily have been consigned to oblivion for another hundred years or lost altogether, accidentally burnt,[8] or even destroyed,[9] perchance, under authority of the next Executive Order, the issue of which might at any time be rendered necessary by the pressure of current business and the congested state of the Indian Office quarters.

An attempt to identify the Indian Office map gave rise to several conjectures, some fundamental, represented by the following and other interrogatories:

1. Is it a map illustrative of the Lewis and Clark expedition?
2. Was it made subsequent to the expedition?
3. Was it made during the expedition?
4. Was it made anterior to the expedition?
5. If made before the expedition, is it,
    a. The Mackay map?
    b. The Evans map?
    c. A composite itinerary map?
6. What is its geographical and historical value?

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[6] Clark's letter to Biddle, January 27, 1818, reproduced in facsimile in Coues, Vol. 1, would indicate that Clark was of the opinion that he had a perfect right to hold back at discretion anything bearing upon the expedition that was not of strictly scientific value and that, under no circumstances, did he entirely relinquish certain possessory rights in the data. This may account for the Indian Office map's not being with the rest of the Clark data. In other words, the "retained" on the wrapper is significant. It implies that the map was not left at the headquarters of the Central Superintendency by accident.

[7] Agency and Superintendency papers, sent in from the field, after an office is discontinued or changed in location, bear, of course, no file-marks. They are only indirectly a part of the Indian Office records and are not so well looked after as even the regular files.

[8] The particular "Accounts" in which the map was found were and are stored in the basement of the Pension Building in close proximity to the furnace. So cramped is the Indian Office at present that there is really no other place for them.

[9] Under comparatively recent Congressional enactment, no government records can be destroyed until they have first been submitted to a competent authority in the Library of Congress in order that their historical value or lack of value may be determined. In practice, the departments submit a list of the

Considering these questions in their order, we can begin by answering the first of them in this wise: The map is most certainly illustrative of so much of the Lewis and Clark expedition as extended from the point of beginning, St. Charles, to the Mandan villages. The proof of this is found chiefly in the fact that all places of importance, mentioned in any of the travel narratives descriptive of the expedition, are marked upon the map as well as at least one thing[10] that the explorers heard about in the course of their voyage up the Missouri River and incidentally commented upon. Moreover, the map itself bears this endorsement (Fig. 1) :[11]

For Capt^n William Clark
or
Capt^n Meriwether Lewis
a
on their voyage up the
Mississippi.

The only noteworthy expedition that Lewis and Clark ever made together was the famous one of 1804-1806. The name "Mississippi" must have been accidentally inserted in the endorsement instead of that of "Missouri"; for the map is not in any sense illustrative of the Mississippi region and it is of the Missouri. It is worth noting, however, that the same confounding of the Mississippi with the Missouri occurs in the Jefferson correspondence bearing upon the great expeditions.

The Indian Office map appears not to have been made subsequent to the expedition, at all events, not in its entirety and not in its main portion; for, although, as will be conclusively proved before this study is done, it carries more of the journal geographical detail than any known map of the time, it varies from the journals in certain marked ways, or, more specifically speaking, it does not accord closely enough with them to have been made

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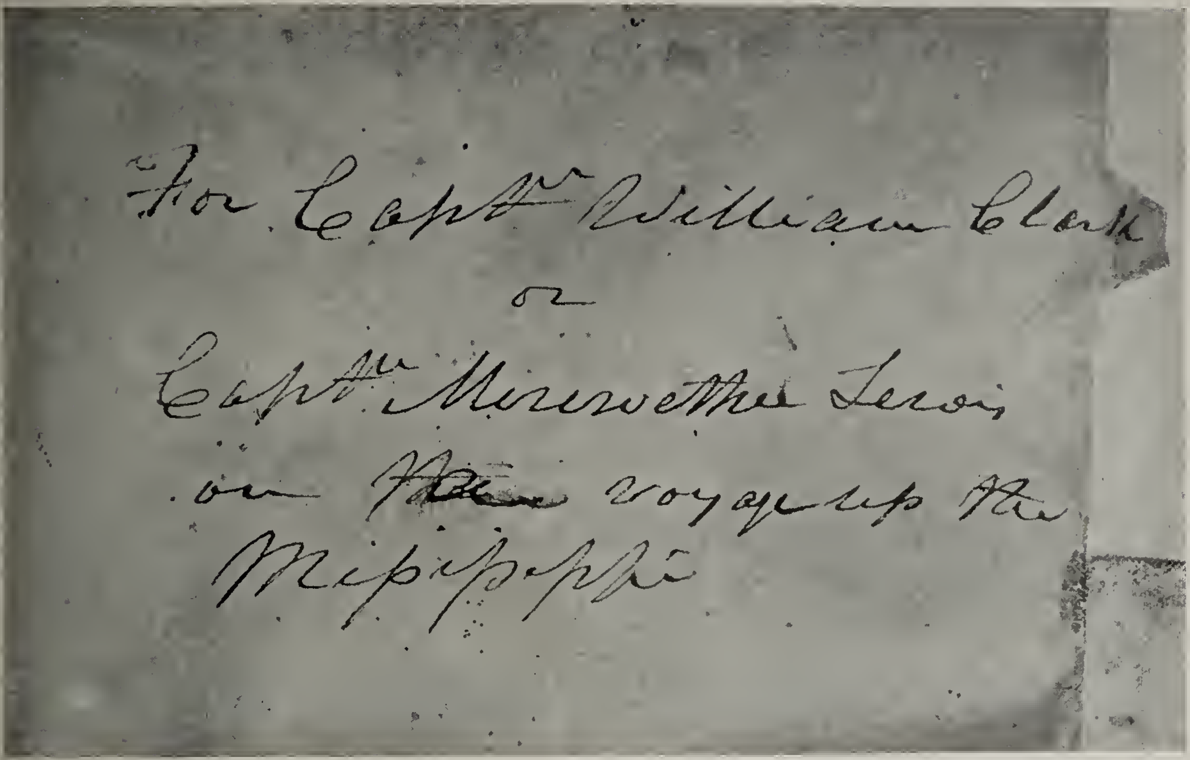
papers set aside for destruction, and occasionally that list is so non-committal that it is returned for more specific detail. Neither the ordinary list nor the additional description would ever have saved the Lewis and Clark map from destruction. How it came to be among "Accounts" is a mystery; for "Accounts," properly speaking, are regular Indian Office records, and the bundle in which the map was belonged to Superintendency records. Its being among "Accounts" made its situation all the more precarious. "Accounts" figure in duplicate, and the Indian Office has frequently gone upon the supposition that since the originals are in existence anyway, lodged with the Treasury Department, the duplicates among its files may well be the first things to be disposed of when more room is needed—and it is even now urgently needed—for current business.

[10] "Mr. Louisells House in the Winter 1803 & 4"

[11] The endorsement is on the back of the map and is reproduced here as it is in the original. Another thing on the back of the map may possibly be an additional means of identification. It is the name of "Peter Tabeau." The name appears written first in pencil, thus:—Mr. Peter Tabeau, and then in ink, thus (Fig. 2):—

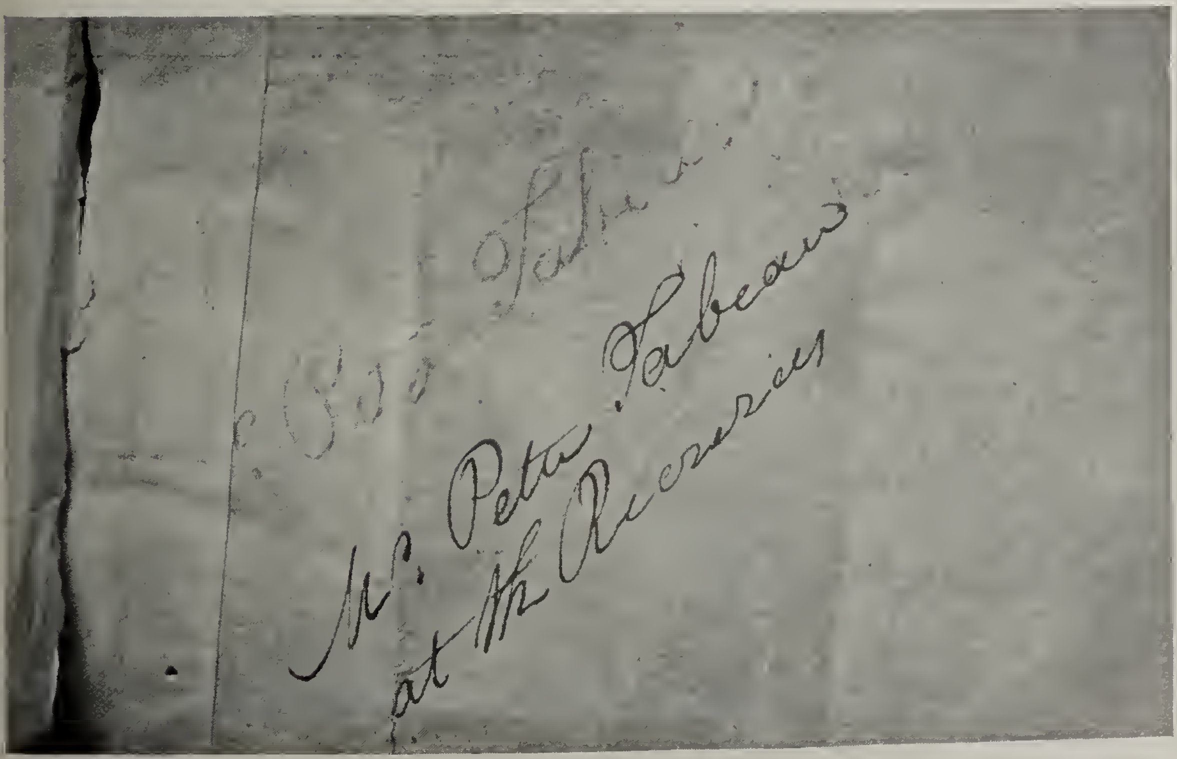
Mr. Peter Tabeau
at the Ricaries.

In the journals there are various references to a Mr. Tabo, or Tabeau. Thwaites, in his index to the "Original Journals," mentions only one Tabeau and that one bears the Christian name of "Antoine"; but, in the text of the narratives, the mention is usually of "Mr." Tabo, or Tabeau. Antoine is referred to directly in one instance only, which might imply that wherever else a Tabeau is noted some other one than Antoine, or Anty, is meant. Such a supposition would permit of a place for Peter. The Tabeau of the journals, whatever his Christian name may have been, is always found associated with the Arikara Indians (Ricaries).



For Captn William Clark
or
Captn Meriwether Lewis
on ~~the~~ voyage up the
Missisippi

FIG. 1.



Mr. Peter Tabeau
at the Ricarees

FIG. 2.

FIG. 1—Endorsement on the back of the newly discovered Lewis and Clark map.

FIG. 2—Additional entry on the back of the map.

from them. And it is not in any way related to the Lewis 1806 map,[1] which we know to have been compiled from the travelers' data.

A close scrutiny of the discrepancies between the journals and the Indian Office map strengthens the opinion that not only was the map not made subsequent to the expedition, but it was not even made during the expedition. The very differences are of such a nature that they attest the fact that the map antedates all the written records. Neither names assigned to newly discovered places—that is, places noted for the first time by these explorers—, nor new names assigned to places previously known appear on it, as is sufficiently instanced in the cases of "Independence Creek,"[13] discovered July 4th, 1804 "Council Bluffs,"[14] in the vicinity of which the explorers held a council with the Indians, "Floyd's River,"[15] named after Sergeant Floyd of the expedition, who died August 20th, 1804, and the "Teton River,"[16] rechristened because the Teton Sioux were found dwelling in its neighborhood. Furthermore, some few things that Lewis and Clark had heard about but which they were obliged to record in their journals as not having been found, notably, "the old fort"[17] on the Missouri River, above its junction with the Grand, and "the old volcanoe,"[18] southward of the mouth of the White, have, on the Indian Office map, a rather conspicuous position, as have also many places that either are not referred to in the least by the journals or are referred to under other names.[19] Quite interestingly, too, an occasional item of the map data is incorrect when judged by the journals.[20] Finally,

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[12] Conveniently to be found in Coues.

[13] "... as this Creek has no name, and this being the 4th of July the day of the independance of the U S. call it 4th of July 1804 Creek, ... this Creek we call *Creek Independence* ..." (Thwaites, Vol. 1, pp. 66-67).

"... passed a creek ... which we called INDEPENDENCE ..." (Hosmer's "Gass," p. 11).

[14] "The situation of our last Camp *Councile Bluff* ..." (Thwaites, Vol. 1, p. 98).

"*Thursday 2nd* ... This place we named Council-Bluff ..." (Hosmer's "Gass," p. 17).

"... 12 of the Zottoe Indians Arriv^{d} at Our Camp Call^{d} the Council Bluffs, or the Brarareham prarie ..." ("Whitehouse's Journal," p. 47).

[15] "... We buried him (Floyd) on the top of the bluff ½ Mile below a Small river to which we Gave his name ..." (Thwaites, Vol. 1, p. 114).

"... Our commanding officers gave it the name of Floyd's river; ..." (Hosmer's "Gass," p. 21).

"... we named this hill Sg^{t} Floyd's Bluff we then proceeded on to a Creek on the Same Side which we named Sg^{t} Floyds Creek" ("Whitehouse's Journal," p. 51).

[16] "... Came to about 1½ Miles above off the Mouth of a Small river about 70 yards wide Called by Mr. Evens the Little Mississou [*Missouri*] River. The Tribes of the Seauex Called the Teton, is Camped about 2 Miles up on the N. W. Side, and we Shall Call the River after that Nation, *Teton*. ..." (Thwaites, Vol. 1, p. 163).

[17] "... we came to on the S. S. in a Prarie at the place where M^{r} Mackey lais down a old french fort, ..." (Thwaites, Vol. 1, p. 50).

[18] "... I walked on Shore with a view to find an old Vulcanoe, Said to be in this neighbourhood by M^{r} J. McKey of S^{t} Charles. I walked on Shore the whole day without Seeing any appearance of the Vulcanoe ..." (Thwaites, Vol. 1, pp. 146-147).

[19] The most prominent of these are: Renville River, probably what the explorers called the Whitestone (*cf.* Thwaites, Vol. 1, p. 119; Coues, Vol. 1, p. 84; Whitehouse, p. 52; Gass, p. 22), or the present Vermilion, and Old Englishman's Island. Some of less significance are: Tobacco Island, Five Barrels Island, Iron Island, Peter's Island, Good Island, the Four Islands, Buffalo Island, Little Island, Isle of the Sioux, Polecat Island (apparently in the neighborhood of the place where the explorers say they found pole-cats, September 17, 1804), Half-moon Island, Little Missouri Island, Friendship Island, Cock Island.

[20] Some of these will be noted presently in another connection; but the discrepancy involved in the location of Cock Island (I. au Coc) may as well be disposed of here. Cock Island appears on the map a considerable distance above the mouth of the Maropa River; but the only thing mentioned in the travel narratives that would correspond to it is Grouse Island, and Grouse Island was passed by Lewis and Clark

innumerable small creeks and islands and a few other things,[21] noted by the explorers, and some of them expressly named[22] by them, are not on the map at all.

In addition to what has already been said answering negatively the third question in our scheme of conjecture, Was the map made while the expedition was in progress? these facts can be adduced: The paper is too thin and the chirography too regular and too elegant, the lines of writing are, as a rule, too uniformly parallel to warrant the supposition that the map was made, from start to finish, under the rough conditions incident to travel. It might, indeed, be thought from the appearance of the map that it was not even taken upon the voyage. It shows so few signs of really hard usage. It is true it is very brittle now, so brittle and worn that it will scarcely bear handling. The brittleness, however, is simply a sign of age, perhaps, also, the result of folding[23] and of exposure to intense heat.

That the map was taken upon the expedition and used and consulted may be readily surmised from an examination of certain interesting additions to its data, additions made under circumstances no more conducive to neat work than most likely were those connected with the voyage of 1804. The extreme northwestern section of the map, that depicting the region, say, between the White River and the Mandan villages, has every appearance of having been checked up by means of underscoring lines.[24] Not too much need be made of the circumstance, however, since the check marks occur only at rare intervals, and, all told, are exceedingly few in number. It is just as if the explorers treasured their map too highly to care to deface it.[25] In the same upper portion of the map occurs material that may or may

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after they had passed the Sur-war-kar-na and before they had come to the We-tar-hoo, much less to the Maropa (*cf.* Thwaites: Original Journals, Vol. 1, pp. 182-183). Cases where an island and a creek in close proximity to each other carry the same name, the one being on the map and the other in the journals, are not regarded, in this study, as mistakes or discrepancies. We have, for instance, an I. au Bonhomme on the map, a Bonum Creek in the journal; a R. a la L'outre on the map, a Luter Island in the journal, and so on. There is, on the map, a small unnamed stream opposite I. au Bonhomme and an island opposite R. a la L'outre.

[21] A few of these are: Island of Mills (Thwaites, Vol. 1, p. 43), Sheeco Island (*ibid.*, p. 45), Plumb Creek (*ibid.*, p. 46), Tabboe Creek, Tiger River, Panther Isle (*ibid.*, p. 52), Hay Cabbin Creek (*ibid.*, p. 57), Chabonea Creek, Bennet's Creek (*ibid.*, p. 58), Dimond Island, Biscuit Creek, Tree Frog Island, Tree Frog Creek (*ibid.*, p. 63), Four le tourtere Prarie (*ibid.*, p. 83), Lake Despree (*ibid.*, p. 103), Black Bird's grave (*ibid.*, p. 106), Mahars Wau can di Peeche Creek (*ibid.*, p. 107), Good Humered Island (*ibid.*, p. 163), etc.

[22] Cupboard Creek, Nightingale Creek (Thwaites, Vol. 1, p. 38), Lead Creek, Sand Creek (*ibid.*, p. 40), Indian Knob Creek (*ibid.*, p. 92), No Preserves Island (*ibid.*, p. 140), Corvus Creek (*ibid.*, p. 150), Sentinal Creek, Lookout Creek (*ibid.*, p. 175), Island of Caution (*ibid.*, p. 177), etc.

[23] It had been folded into small compass and, when found, was cracked and broken at the seams. An unwise attempt to repair such damage resulted in worse. As a matter of fact, the frail paper should have been immediately mounted upon linen or something equally broad and stable.

[24] R. petit Missouri is underscored; so is an unnamed right tributary farther upstream, so also are the Maropa River, Labeaume's River, and various of the Indian village groups. I have taken the unnamed river of the map to be the We tar hoo of the journals (*cf.* Thwaites, Vol. 1, p. 183), described as heading in the Black Hills, which, on the map, it does.

[25] There is some reason for thinking that the explorers guarded and handled their map so carefully that they did not consult it on every possible occasion. Had they done so, they would most certainly have remarked the fact that the river they note as known by the name of Whitestone was labeled on the map the Renville. This they did not do.

not be new. It consists of legends crowded in,[26] forcing a departure from the original parallel appearance of the lines of writing. The chief objection to considering this matter new is the fact that the legends are in both French and English. Lewis and Clark, as will be argued more at length later on, could have had no good reason for inserting into the detail of a map already crowded the French equivalents of insignificant place names. Most of the additions, if additions they be, inclusive of the underscoring lines, were made in lead pencil.[27] Some were later inked over,[28] others left in penciled form.[29] A few additions,[30] occurring at the top of the map, were written in the first instance with ink and are taken to be additions because the penmanship is large and sprawling, quite different in general character from that of the bulk of the map. They include names like St.

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[26] I am not at all prepared to insist or even to claim that this seemingly crowded-in material is new. It has the appearance of having been written with the same quill and by the same hand and to have been inked at the same time as the bulk of the map. Moreover, I am puzzled by the fact that Good Hope Island, which the explorers introduced (Thwaites, Vol. 1, p. 179) by the familiar, "we call", is not crowded in and is not in a different handwriting and has its French equivalent, I. bonne Esperance, immediately below itself on the map. It is barely possible, of course, that in this case Lewis and Clark erroneously but inadvertently claimed the credit of having done the christening. On the western side of the Missouri River and nearly opposite the mouth of the Otter River is a large stream designated simply "Riviere" on the map. In location it exactly corresponds to the Sur-war-kar-na of the journals and, as Lewis says in his notes (Thwaites, Vol. 6, p. 49), it "takes its rise short of the Black Hills . . ." The writing of the word "Riviere" is fine and regular, the *e* differently shaped from the usual *e* of the map. Is it fair to conclude, then, that the person who attempted to add the name stopped short at "Riviere" because he could not spell the Indian Sur-war-kar-na? Other instances of the kind are not entirely wanting, as for example, "Prairie du", "Prairie," "I-& village".

[27] The skeleton of the entire map seems to have been traced originally in pencil.

[28] As for instance, "Mr Louisells House in the Winter 1803&4" and "50 Leagues to the Mouth of the Missouri", the latter legend being written on what I have chosen to regard as an extended portion of the map and, therefore, new. The part referred to is unmistakably an extension and in no sense a part of the original drawing, it being very plainly discernible where the work of one cartographer ended and that of another began. The extension is drawn on approximately the same scale as the remainder of the map. It reaches from and beyond the Mandan villages, perhaps in order to make a proper connection with the Yellowstone and was very probably put in after Clark had returned to the Mandan villages by way of the Yellowstone.

[29] Some of these I cannot satisfactorily decipher. An extremely faint legend beyond the Black Hills I at first thought might possibly be meant for "Jon Vallie," and the journals tell us that the travelers did fall in with a Frenchman of that name (the Jean Vallé of Thwaites's suggestion), who informed them "that he wintered last winter 300 Leagues up the Chien River under the Black mountains . . ." (Thwaites, Vol. 1, p. 176); but I have since changed my mind. Two of the penciled names that I can decipher are "Yellow Stone R." and "Fork River." "Fork River" is written alongside of "Dog River" (R. du Chien), but upside down, a circumstance which supports the contention that penciled names are new. "Yellow Stone River" and "Black Mountains" had no pencil foundation: but "Black Hills" is found written near the margin, in pencil. Some writing on the upper waters of the James River has been rendered a trifle more clear by the photostatic process but is not yet clear enough to be confidently interpreted.

[30] My supposition is that these additions were made by the explorers to indicate the "headings" of rivers. Again and again they tell us of what they have learned about the sources of some of the rivers they pass or of such and such a river "heading" in a certain locality or at some approximate distance. Thus, on June 13, 1804, they record that the Grand River "heads with the R. Dumoine," and the map suggests it. Under date of August 29, 1804, the river James (Jacques, or Yankton) is described as passing the Sioux River and as heading with the St. Peters. On the map, the James River (R a Jacques) parallels an improvised Big Soox, rising beyond it to the north, and receives a tributary from the direction of the Red River of the North, also improvised. On the 13th of October, Lewis and Clark learned from the Rickores (Ariekaras) "that the Yankton or R Jacque heads at about 2 Days March of this place Easterly, the R. de Seaux one Day further, the Chien (*Chayenne the Chay*^{s} *formerly there*) a branch of R. Rouche (*Rouge*) Still beyend, and the River S^{t} *Peters* 4 days march from this place on the Same Derection . . ." On the map, again, the "Riviere" appears to rise in the first range of the Black Hills and to that Clark bears testimony under date of October 7th.

Peters, Demoin, Big Soox, and Camerons House. It took some little time to decipher the name last given, the map being defective and the writing scarcely more than a mere scratch of the pen. Reference to Lewis' notes, however, revealed[31] the fact that a trader of the name of Cameron[32] had been heard of as having his headquarters in the region, and a photostatic copy of the map disclosed, much more clearly than did the original, the legend, "Camerons House."

The addition that is a really worth while contribution is something that has been already cited twice in the footnotes, namely, "Mr Louisells House in the Winter 1803 & 4." This legend is in the near vicinity of "Island of the Three Sisters" (Les I. de 3 Soeurs) and "Goat Island" (I. au Cabris). It is written upside down. The history of its insertion may be suggestively traced by means of journal entries. When Lewis and Clark were in the neighborhood of River a Chouritte, May 25, 1804, they record[33] that they "met with M. Louisell, imedeately down from the Seeder [Cedar] Isl^{d} Situated in the Country of the Sciox [Sioux] 400 Leagues up . . ." and that Mr. Louisell gave them "a good Decl of Information . . ." Very probably he told them of the location of his own trading house. Anyway, on the twenty-second of September, after they had passed an island, "Called the 3 Sisters," they came to one, "Called Ceder Island," and this is what they have to say about it: "this Island is about 1½ miles long & nearly as wide Covered with Ceder, on the South Side of this Island Mr. Louiselle a trader from S^{t} Louis built a fort of Ceder & a good house to trade with the Seaux & Wintered last winter: . . ."[34] After taking careful note of Louisell's fort,[35] they "proceeded on and Camp^{d} late on the S. Side below a Small Island in the bend S. S. Called Goat Island, . . ."[36] It is interesting to observe that map and journal, with Clark as the writer of the one particular entry[37] and Lewis of the other,[38] spell the trader's name in exactly the same way. Lewis, it is true, adds a final *e*; but that need not be deemed significant, because the spelling of the journals varies to a remarkable degree and even in the same sentence. Gass spells[39] the name "Lucelle," and it wa ordinarily spelled "Loisel."[40]

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[31] ". . . The Sioux annually hold a fair on some part of this river (James), in the latter end of May, thither the Yanktons of the North, and the Sissitons, who trade with a M^{r} Cammaron on the head of the S^{t} Peters river, bring . . ." (Thwaites: Original Journals, Vol. 6, p. 45).

[32] Undoubtedly the same as the Cameron of the Journals ("Original Journals," Vol. 1, p. 267) and the Murdoch Cameron who, in 1805, was a trader on the St. Peters in Minnesota. (*Cf.* Coues: New Light on the Early History of the Greater Northwest, Vol. 1, p. 189, note 8. See also Coues: The Expeditions of Zebulon M. Pike, Vol. 1, p. 66 and note, p. 64. Pike calls Murdock Cameron "a Scotchman by birth, but an Englishman by prejudice," *ibid.*, p. 64).

There were several men of the name of Cameron connected with the Northwest Company (*cf.* Masson, Vol. 2, p. 231, and Coues: New Light on the Early History of the Greater Northwest, Vol. 1, p. 189, note 8). For additional information about Murdoch Cameron, see Neill's article on "Indian Trade" in *Minnesota Hist. Soc. Annals*, 1852, p. 43.

[33] Thwaites: Original Journals, Vol. 1, p. 29.

[34] *Ibid.*, p. 160.

[35] Gass gives a minute description of the fort, including its dimensions, which would indicate that it was carefully examined by at least some of the party.

[36] Thwaites: Original Journals, Vol. 1, p. 161.

[37] May 25, 1804.

[38] September 22, 1804.

The similarity in spelling that has just been noted is all the more worth of remark, because, ordinarily, the spelling of what, for the sake of argumen if for nothing else, we have chosen to regard as the older part of the map i most emphatically not the spelling of the journals.[41] The map almost invar ably presents the French place-name and its English equivalent, or what i intended[42] to be an English[43] equivalent, and the use of the two language gives color to the view—particularly as the French is the original[44] and th English the translation—that the map was most certainly not made durin the expedition or afterwards. The explorers were Americans using th English language as their native tongue. They could have had no reaso for jotting down, first hand and systematically, the French name for eve tiny creeks, notwithstanding the fact that some of their employees wer Frenchmen and that they were constantly coming across Indians to whon the French language had become as familiar as their own. Besides, th map data that, for other reasons, seem to be new, do not, in a singl instance, have a strictly French form. The journals sometimes give th French name but they always give it as additional or explanatory infor mation, except in cases where the French name must have been the only one known and used. Discrepancies in spelling are often to be accounte for by the varying use of French and English or by a very limited knowledge of the former. They are not such as would preclude the idea that th map was in the hands[45] of the explorers for, at the least, occasional consultation, but they would contradict the notion that the legends on the map were written either at the same time as or from the journals.

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[39] *Cf.* Hosmer's "Gass's Journal," p. 35.

[40] For instances of such spelling, see the report of Regis Loisel, signed by himself, dated San Luis d Ylinoa, May 28, 1804, published in Houck's "Spanish Régime in Missouri," Vol. 2, pp. 359-364, also Billon' "St. Louis in the Early Days," p. 465; and a Clark memorandum (Thwaites, Vol. 6, p. 59).

[41] This statement should be modified to some extent, for quite often the spelling of names, enclosed b parentheses or by brackets, is the spelling. For Thwaites's explanation of enclosed matter, see "Origina Journals," Vol. 1, p. 11, note 1. Moreover, *antient* is used on the map and in Clark's contribution to th travel narratives, which is a rather interesting coincidence, if it is nothing more.

[42] Sometimes the equivalents are what one might call the approximate or the obvious rather than th exact translations. Thus, "Isles des Parques" is rendered "Field Islands"; "I. au Cabris," "Goa Island"; "I. au biche," "Elk Island"; "Isle au bœuf," in one place, "Beef Island," in another, "Buffalo Island"; "I. de periche," is "Peter's Island."

[43] In one instance we have an attempted French equivalent, and, at the same time, perhaps, an inter esting case of folk etymology. The present Cannon Ball River is labeled "R. a la Bomb, Labeaume' River." The river was very likely named in honor of Louis Labeaume (Labaume) (*cf.* Houck's "Spanis Régime in Missouri," Vol. 2, p. 299; American State Papers: Public Lands, Vol. 3, p. 699). The name woul literally mean "balm"; but the spelling Labaume would indicate the pronunciation and explain, in a measure, the supposed equivalent.

[44] There seems no good reason to doubt this. The French has always the right of way on the map It is the one written first and the one that has the greater amount of room given it. Yet I would not hav it thought that I incline to the opinion that the English was added later. Both the English and the Frenc appear to be the work of one draftsman.

[45] It seems a little strange that, if the explorers did have the map before them, they did not see fi to comment upon some of its peculiarities. Why, for example, did they not mention in their journal Labadie's Island, Lapensee's Channel, R. & Chanaille de baton (Cane River and Channel), Premier Post

It now having been determined that the Indian Office manuscript map could scarcely have been made either during the progress of the Lewis and Clark expedition or subsequent to its completion, inasmuch as map and narrative journals differ too much in terminology and in character of information conveyed for them ever to have been the work of the same mind or minds and of the same period, there remains a consideration of the question whether or no the authorship of the map is to be ascribed to one of two men, James Mackay, a Scotchman, and John Evans, a Welshman, both of whom, in their capacity as agents of the Missouri Company, are believed to have prepared a map illustrative of that particular part of the Missouri River region that they individually explored. Up to date neither map has, for a certainty, been seen since the prosecution of the Lewis and Clark expedition.

The organization of the Missouri Company, a commercial concern, having for its object the establishment of trade relations with the great tribes of the Upper Missouri, though begun earlier, was not formally completed until May, 1794. Its headquarters were at St. Louis, and from that point, during the next few years, various exploring expeditions started out. The first was led by Jean Baptiste Truteau. From June 7, 1794, to March 25, 1795, Truteau penetrated a considerable distance up the Missouri in what proved to be a vain search after the Arikaras and, in the summer of 1795, he sojourned about two months among them. His diary, describing the incidents of the first summer,[46] has recently come to light and bears an interesting

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de la Compagnie du Missouri, Riv. & Village des Petite Os, R. du vieux Langlois, and, finally, the most puzzling thing on the map, Riv. à Renville?

As a general thing it can be said that most of the prominent people interested in Indian trade at the time are represented by name upon the Indian Office map. No doubt the expression, "vieux Langlois," ought not to be translated into "old Englishman's," since there were traders of the name (*cf.* Henry's "Journal," in Coues's edition, Vol. 1, p. 50, note). Concerning the Riv. à Renville, some additional remarks might well have a place here. The first letter of the name on the map proved exceedingly difficult of determination. The river, bearing the name, is evidently the Whitestone of the journals and the Vermilion of today. The initial part of the map name might easily pass for *Th*, *K*, or *R*. The resulting name would then be Thenville, Kenville, or Renville; but no such name appears upon any contemporary map that has been, for purposes of this study, accessible, either in the Library of Congress or elsewhere. In travel narratives of the Missouri River region and beyond "Thenville" does not seem to figure at all. "Kenville" does, but out of range of the Vermilion (*cf.* Coues: New Light on the Early History of the Greater Northwest, Vol. 2, p. 627). A Joseph Renville, on the other hand, was known in the early days on the Upper Missouri. He was probably born about 1726 (*cf.* Tanguay's "Dictionnaire Généalogique des Familles Canadiennes," Vol. 3) and, at the time of the organization of the Northwest Company, identified himself with it (E. D. Neill: Indian Trade, *Annals Minnesota Hist. Soc.*, 1852, p. 42). This would have doubtless brought him,-as it brought Faribault (*cf.* H. H. Sibley, in *Minnesota Hist. Collections*, Vol. 3, p. 171) into the country of the Yankton Sioux. At all events, he married a Sioux woman. His son, another Joseph Renville, was a Sioux interpreter in the time of Pike (*cf.* Coues: The Expeditions of Zebulon M. Pike, Vol. 1, p. 40, note 46) and was later associated commercially with Dixon, who had a post in the vicinity of the mouth of the Vermilion, hence the name, "Dixon's Bluff" (*cf.* map published with the Report of I. N. Nicollet, *Senate Doc., 26th Cong., 2nd Sess.*). The region of the Vermilion was originally Sioux country, and it seems more than likely that the father, equally with the son, traded there. The name is variously spelled, even as late as the middle of the nineteenth century, Renville or Rainville (*Indian Office Register of Letters Received*, Vol. 28, July 11, 1844, and July 18, 1844).

[46] This is the so-called first part of Truteau's journal, and it was discovered in the Archives of the Indies at Seville by Roscoe R. Hill. It covers the period from June 7, 1794, to March 25, 1795, and is to be found, in its French form, in the *Amer. Hist. Rev.*, January, 1914, pp. 301-333. The second part of Truteau's journal, that extending from May 24, 1795, to July 20, 1795, has been known for some time. It appears in translation in the *Missouri Hist. Soc. Collections* for 1912. Strictly speaking, perhaps, it should be counted the third part, since a narrative of the intervening period, from March 25, 1795, to May 24, 1795, is supposed to have been prepared and may be yet in existence somewhere.

comparison with the Indian Office manuscript map. This idea will b
enlarged upon later.

In 1795, Mackay was similarly sent up the Missouri, and he explored the river course as far as the Omaha, or Maha, villages.[47] He was accompanied[48] by Evans whom, in the year following, he himself authorized[49] to proceed farther, even to the Mandans. Evans reached his destination in due season and destroyed a British fort, or trading post, erected there.[50] Of his later movements, little is known. In 1799, Mackay reported him as ill and his system deranged.[51] He probably did not long survive. Mackay, on the other hand, lived for several years, dying in 1823.[52] He made his home within easy reach of St. Louis, occupied most of the time with matters that involved him in land litigation.

Reference has already been made to a possible Mackay and to a possible Evans map, and the evidence bearing upon each point will now be investigated. That a Mackay map once existed is inferred from a statement[53] made by James Mackay himself to the effect that, from a certain voyage of discovery up the Missouri River, he had brought memoirs and a map, and likewise from two[54] references in the journals of the Lewis and Clark expedition. A third[55] reference is sometimes cited as also testifying to the existence of a Mackay map; but it is of such a nature that it might better imply a conversation than a map, and such a conversation Lewis, if not Clark, could most certainly have had with Mackay on the occasion of one of his frequent trips to St. Louis and vicinity while the expeditionary party was encamped from December to May on the Dubois River.

The proof that there was ever an Evans map is to be found in the correspondence of Jefferson as well as in the journals[56] of the Lewis and Clark expedition. Jefferson, writing to Lewis, January 13, 1804,[57] with reference to the preparations being made for the proposed exploration of the Missouri, said, "I now inclose you a map of the Missouri as far as the Mandans. 12 or 1,500 miles I presume above its mouth, it is said to be very accurate having been done by a M^{r} Evans by order of the Spanish government. . . ."

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[47] See "Report of Governor Zenon Trudeau, 1798," in Houck's "Spanish Régime in Missouri," Vol. 2, p. 253.

[48] Michaux gives as a journal entry for December 11, 1795, the following: "I was informed at Illinois that Mackey a Scotchman and Even a Welshman, started at the end of July 1795 from St. Louis to ascend the Missouri in a 4 oared Barge. They are aided by a Company whereof Charles Morgan (Jacques Clanmorgan), a creole from the Islands, is manager." (*Cf.* Thwaites: Early Western Travels, 1748-1846, Vol. 3, pp. 79-80.)

[49] "Through my fear of arriving late next summer at the Mandans, I am going to send out a detachment within a few days under charge of Monsieur Even, until he meets Trudeau who must have already constructed his fort among the above-mentioned Mandans, if he has experienced no opposition on the part of the English, who have had the audacity to unfurl their banner there." (*Cf.* Mackay's "Journal" in Houck's "Spanish Régime in Missouri," Vol. 2, p. 192.)

[50] See Thwaites's British Régime in Wisconsin, *Wisconsin Hist. Collections*, Vol. 18, p. 451, note 72.

[51] American State Papers: Public Lands, Vol. 6, p. 719.

[52] See Houck's "History of Missouri," Vol. 2, p. 71, note 145.

[53] American State Papers: Public Lands, Vol. 6, pp. 718, 720, and Vol. 8, p. 868.

[54] Original Journals, Vols. 1, p. 50, and 6, p. 125.

[55] *Ibid.*, Vol. 1, p. 147.

[56] *Ibid.*, Vol. 1, pp. 163, 195, 198, 200.

[57] Jefferson Papers, Letter Press Copy Books, Series 1, Vol. 10 (1804-1805), No. 1.

Writing again, on the 22nd,[58] he repeated his message, saying, "... in that of the 13th inst. I inclosed you the map of a Mr Evans, a Welshman employed by the Spanish government for that purpose." Jefferson had previously sent to Lewis extracts[59] from the journal of Truteau. Later on, he sent a transcript.

It now behooves us to decide the question of the identity of the Indian Office map with the Mackay map. The former shows the Missouri River country to the Mandan villages; but, so far as we know, Mackay never went beyond the recognized territory of the Omahas and Poncas. It is, of course, barely possible that the maps ambiguously attributed severally to Mackay and Evans were a single joint affair, Mackay contributing the data for the lower part and Evans that for the upper.[60] Jefferson may have been impressed with the idea that it was entirely the work of Evans; because he was chiefly concerned with its farthermost reach and it was probably matter of common report that Evans had traveled to the Mandans. The map satisfies, with one possible exception, the journal references to both Mackay and Evans, so that they furnish little assistance on this particular point. The map maker, whoever he may have been, had no great mastery of the French language.[61] Nothing is known concerning Evans' knowledge of either French or Spanish; but Mackay's[62] seems to have been worthy of special comment. Teggart, be it remembered, is of the opinion that the Perrin du Lac map is substantially the same as the Mackay map.[63] That being the case, the Indian Office map is certainly not the Mackay map. Both may, perchance, be copies of the same original. They are enough alike to give some support to that view and yet they differ in marked ways.[64] The Perrin

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[58] *Ibid.*, No. 8.

[59] *Ibid.*, Vol. 9 (1802-1803), No. 305.

[60] There is a slight difference in the workmanship of the two parts of the Indian office map, the lower part showing greater wealth of detail.

[61] This is illustrated in a number of ways, as, for instance, in confusion of gender, in ignorance of exact or of fine shades of meaning, and in the use of the article. The following are cases in point:

Rivière à la roche percée, really "Pierced Rock River," is rendered "Split Rock."

Rivière petit Manitou, "Small Great Spirit River," is rendered "Little Conjurer River."

Rivière à flèche, "Arrow River," is rendered "Flint River."

Petite rivière platte, "Little Flat River," is rendered "Little Shoal River."

Rivière au vase is translated as "Muddy River." It would be correct to call the river such, were the expression "Rivière à vase," since *vase*, feminine gender, means "mud." *Vase*, masculine gender, means a "vase."

Isles des Parques is translated, "Field Islands"; but the plural of the French word, signifying the English "park," is *parcs*. *Parques* would be more correctly rendered "the Fates."

I. au cabris offers a case of a singular article and a plural noun.

I. au biche is translated "Elk Island"; but *biche* is a feminine noun and signifies the female deer.

[62] Houck's "History of Missouri," Vol. 2, p. 70; Teggart's "Notes on Lewis and Clark" in *Rept. Amer. Hist. Assoc.*, 1908, p. 194 and note *h*.

[63] *Rept. Amer. Hist. Assoc.*, 1908, pp. 188-189.

[64] The subjoined tabulation is based upon a comparison of the two maps from the Grand River to the point on the Missouri where the Perrin du Lac map data end:

Perrin du Lac Map	*Indian Office Map*
Wachante ou endroit de serpens	Wocanton, ou Endroit des serpents
Anciens villages des petits Os et Missouris	Antient village des Missouri Antient vill of the Missouri
	Antient village petits os Antient village of the little Osages
vieux Fort	Vieux fort
Marais des apaques	marais des apaques flag Pond

du Lac map[65] does not satisfy all the journal references; but it does give, as the Indian Office map does not, the Mackay route of 1796. It is faulty in its use of French, as is the other. Both call a certain thing, Marais des apaques, which the Indian Office map translates as Flag Pond; but, while the Perrin du Lac map offers *ancien* for "old" or "former," the Indian Office map offers the incorrect, or at least unusual, *antient* of the journals. Conversely, be it said the Nichinibatone of the Perrin du Lac map more nearly approaches the Neesh-nah-ba-to-na of the journals and of today than does the "R. & Chanaille de baton" of the other map.

That the Indian Office map is the map that, under the name of the Evans map, was transmitted to Lewis by Jefferson is the most satisfactory conclusion reached by the author of this article. It is not contended that it is the identical map that Evans may have made. Jefferson is really the only authority for the supposition that Evans personally ever made a map, and, as intimated before, the map that goes under the name of the Evans map,

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Perrin du Lac Map	*Indian Office Map*
Prairie de Sacki	Prairie des Sakias Sakia Prairie
R. du Feu	(river unnamed)
Prairie du Feu	Prairie du
R. de l'Eau bleue	l'Eau bleu blue water River
R. des Kancés	Riviere des Kances Kances River
Petite Riviere Platte	petite Riv. platte little Shoal River
J. de Parc	Isles des Parques Field Islands
1er Ancien village des Kances	premier ant^t village des Kances first old vill of the Kances
Wasabi Wachanda	
2o Ancien village des Kances	2nd vieux village Kances 2d old village of the Kances
Prairie S^t Michel	Prairie de S^t Michel St Michael's Prairie
Riviere Madavvay	Riv. Nadawa Mandan River
R. du Loup	R. des Loups Wolf River
	R. Taquio Taquio River
R. Grand Nimakas	R. grand Ni Maha Big Nimaha River
J. S^t Joseph	Isle S^t Joseph St Joseph's Island
R. Nichinibatone	R. & Chanaille de baton Cane River & Channel
R. Petit Nimakas	petit R. Nimaha little Riv^r of the Nimaha
J. Achoven	Isle Chauvin Chavin's Island
l'eau qua pleure	R. Eau qui pleure weeping water
	I. du Tobac Tobacco Island
oeil de fer	I. du fer Iron Isl^d
	I. de 5 Barrils five Barrels Island

(footnote 64 continued on next page)

[65] For convenience of reference, it should be observed that the so-called Perrin du Lac map, originally published in connection with Perrin du Lac's "Voyage dans les deux Louisianes et chez les Nations Sauvages du Missouri en 1801, 1802, et 1803," Paris, 1805, has been reprinted in *South Dakota Hist. Collections*, Vol. 7.

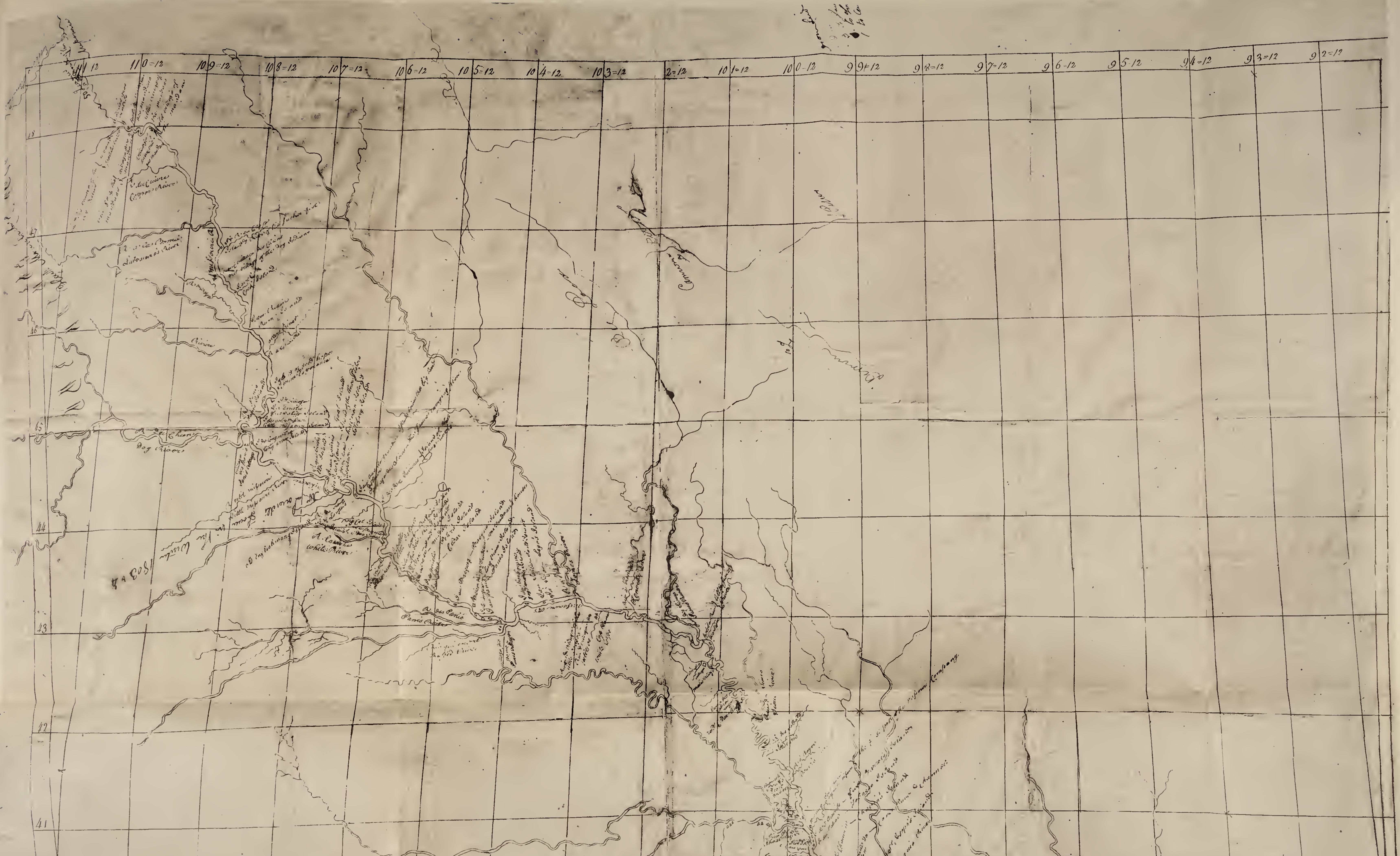
n the Jefferson correspondence, may in reality have been the same map hat Mackay described as his own. Again, let it be repeated that the Indian ffice map satisfies, with one exception, all the Lewis and Clark journal eferences to both Evans and Mackay. It also illustrates the journals genrally and, more important still, it illustrates the Truteau narrative. What Jefferson very probably did was to have a certain map that had come into is possession, maybe through Michaux, and that depicted the Mackay and Evans expedition (for the journeys of the two men were actually parts of single expedition) copied with particular reference to the needs of Lewis nd Clark and its French terminology translated, for their edification, into English. The inexperience of the translator may possibly account for faulty French syntax, for the attempted translation of proper names, and even for the transference of "ancien village des petits arcs" into the very much more natural "Riv. & village des petits os" (River & Village of the Little Osages).

Perrin du Lac Map	*Indian Office Map*
Per Poste de la Compagnie du haut Missouri	Premier Poste de la Compagnie du Missouri the first post of the Missouri Company
R. Platte	Riv. Platte Shoal River
	R. du Papillion Butterfly River
	Aiouah Bluffs Ecore des Aioas [accore?]
R. a Boyer	R. à Boyer Boyer's River
R. des Soldats	R. des Soldats Soldiers River
P^{re} R. des Sioux	Riv. des Sious Sious River
	Ecore des Cedres red Cedar bluffs
Entrepôt de la compagnie village des Mahas	Maha village Maha village
R. des Sioux	petite Riv. des Sious little Sioux River
	Riv. à Renville Renville River
R. a Loutre	
	Cap blanc White cape
ancien village des petits arcs	Riv. & village des petits os River & village of the little Osages
R. Sague	R. a Jacques James River
	I. à Sego Sego's Island
	I. au Sable Sand Island
	I. au bonhomme good man's Island
	village des panis Panis village
	I au Panis Panis Island
	Isle longua long view Island
	Maison de Mr Trudeau Mr. Trudeau's house
R. qui monte	
R. l'Eau qui court	Riv. qui courre [coure or court?] Rapid River
R. des Poncas	R. des Panis
village des Poncas	

The promised comparison of the Evans map, as we will now designate it, with the second part of the Truteau "Journal," reveals a striking similarity in the matter of place names and in the location of Indian villages, but not more so than does a like comparison with the Perrin du Lac map. There are also some noteworthy discrepancies. In Truteau's "Journal" figure "la prairie du feu," "campe au parc," "nichenanbatonnois." Several Indian villages named in the "Journal" are indicated but not named on the map, in one instance, perhaps, because they were off the route of the Lewis and Clark expedition. In the matter of the various Sioux rivers, the "Journal" more nearly corresponds with the Perrin du Lac map than with the Evans. There are three such rivers on the Evans map, the "Riv. des Sious," the Little Sioux of today, the "Petite Riv. des Sioux," the Floyd

Perrin du Lac Map	*Indian Office Map*
I. des Basques	I. au Basques Basque Island
Second Poste de la Compagnie	
I. de Cedre	I. au Cedres Cedar Island
I. a Pierre	I. de periche Peter's Island
	I. au vase Muddy Island
	I. Bon Good Island
	Quatre Isle the 4 Islands
I. du Boeuf	Isle au boeuf Buffaloe Island
I. de Pâte	I. petite little Island
	Viau (?) Volcano old Volcano
R. Blanche	R. blanche White River
	Sious Island Isle des Sious
	I. bete puante pole Cat Island
	I. des deux Rivieres Island of the two Rivers
	Portage des Sious The Sioux carrying place
	R. du vieux Langlois old Englishmans Island
	I au bas de grande Island below the big bend
Grand detour	
	I. solitaire Solitary Island
	I. demi-lune half-moon Island
	I. de 3 Soeurs Island of the three Sisters
	I au Cabris Goat Island
	Mr Louisells House in the Winter 1803&4
	I au biche Elk Island
R. de Cheyenne	R. petit Missouri Little Missouri River
	I de longue vue long view Island
Ancien village de Ricaras	village des Panis Panis Village
R. de Chaguyenne	R. du Chien Dog River

THE EVANS MAP OF ABOUT 1795 OR 1796



This manuscript map of the Missouri River from St. Charles, Mo., near its mouth, to above the Mandan villages, in what is now North Dakota, was found among old files in the Office of Indian Affairs in Washington, D. C. It is probably the map which Jefferson sent to Meriwether Lewis in a letter dated January 13, 1804, prior to Lewis and Clark's departure on their expedition of 1804–1806. It, or the original of which it may be a copy, was presumably compiled in 1795 or 1796 by John Evans, a Welshman in the employ of the Missouri Company.

The map from which this photograph was taken measures along the outer border of the drawing 37½ inches (top; bottom, 36½ inches) by 28¾ inches and is on a scale of 1: 1,630,000. From the present reproduction, which is on a scale of 1:3,670,000, a number of stains and creases have been obliterated in order to bring out the lettering more clearly. In other respects than this it is a facsimile.

of today, and ''Riv. des Sious,'' the Big Sioux. Incidentally, Truteau remarks that there were a number of islands in the near neighborhood of the ''Missouri Blanche'' (White River), and such there are on the Evans map.

In recapitulation, it might be advisable to call attention again to the circumstance, so exceedingly consequential, that on the Indian Office map we find Mackay's ''old french fort,'' his particular ''river Souix,'' and his ''old Vulcanoe.'' We also find Evans' ''Little Missouri,'' his ''Carp Island,'' but, unfortunately not his ''remarkable places.'' We do have, however, definitely located for us, Truteau's [''Trudeau's''] House.

All these things bear witness to the great historical value of the Indian Office map, for, even if it should not be the original map sent by Jefferson to Lewis, it is the most detailed primary source for geographical knowledge of the Missouri River country that has yet been forthcoming. There is a bare possibility that it was made by or under the direction of Lewis and Clark themselves before they started up the Missouri, being to them a composite itinerary map.

UTAH, THE OASIS AT THE FOOT OF THE WASATCH

By MARK JEFFERSON

In the heart of the basin country of the western United States, between the Rockies and the Sierra Nevada, lies an elongated belt of forty-six cities and towns, the least of which has a thousand indwellers and the greatest, Salt Lake City, a hundred thousand. Between these cities the valleys are covered with green wheat fields, squares of alfalfa and plowed land, and clouds of pink every spring when the fruit trees bloom, with the ranches of the owners dotted between. This strip of human occupation in the midst of the wilderness is Utah, the best-defined geographic unit of American states. East of it is the empty wilderness of the Green River canyon country, bristling with crags and cliffs, high plateau remnants isolated by gloomy defiles, with no town of a thousand people till one comes to Grand Junction, Colorado, 140 miles away. West of it for 400 miles stretch the deserts of Utah and Nevada without settlement save for the one little town of Ely, at a distance of 150 miles. At the southern boundary of the state is a gap of fifty miles between the southernmost town of Utah and the northernmost town of Arizona, and there is a similar gap on the north between the towns of Utah and Idaho.

For the most part, the states of the Union are not geographic but purely political or politico-social units. There is no geographic break between Ohio and Indiana or betweeen Indiana and Illinois. The farms and fields are continuous across the boundary, the wood-lots cross it. If a river makes a part of the boundary it is for convenience, or was for the convenience of early administrators when the marking of boundaries cost more than most of the land was worth and the ready-made line of a river-bed was a gift of nature.

As a matter of fact a river, especially if it be of navigable size, does not at all separate the activities of men. A large city on a state boundary inevitably pushes its suburbs across such a river into another state or even into a foreign country. The real city of New York long ago expanded across the Hudson into Jersey City and Hoboken in New Jersey, simply because the river is vital to the life of the city as our great seaport and that vital organ nourishes one shore as well as another. So Philadelphia has expanded across the Delaware and the state boundary into Camden, St. Louis across the Mississippi into Illinois at East St. Louis, and Detroit across its river into Canada at Windsor. In the Old World, where states have acquired their boundaries by a long, slow growth, an important river is rarely part of a boundary, and the great cities stand astride their rivers within a single administrative unit. In the eastern United States, if anything tells the traveler that he has passed from one jurisdiction to another, it is usually some product of legislation that has produced visible human works which extend only as far as the visible boundary. Generally human occupation flows uninterruptedly across the line. For the most part state boundaries are meridians and parallels, lines capable of being marked on the map even before a new country has been explored and readily established on the ground as soon as the cost can be covered. They are naturally in great vogue in all new lands, like Australia or inner Africa as well as America, which are subdivided on paper ahead of their actual occupation. As these lines have no inherent geographic character, but rather an astronomic one, the actual settlements, when they come, spread with the least possible heed to them.

But Utah is a group of homes without near neighbors. For hundreds of miles in every direction from Salt Lake City there are no other large towns. The Utah communities lie in a strip along the western base of the Wasatch, 350 miles long and only 50 wide. The irrigated lands of the state (Fig. 7) lie mainly in the same belt. They occupy 1,560 square miles, or about the same area as the town belt, which, according to the rough dimensions just given, would cover an area of 1,750 square miles. The political state is four or five times as wide. The traveler who crosses it by train has a long journey across empty spaces on either hand. Furthermore this compact isolated strip of settlements lies under the eastern bounding wall of a great depression in the western plateau country. The relief map (Fig. 1) shows this hollow in the plateau at the northwestern corner of the state of Utah. Its area is about 20,000 square miles. Its surface is everywhere less than 5,000 feet above the sea. Great Salt Lake lies at the lowest point of the basin, which was in ancient times filled by the fresher waters of Lake Bonneville, which overflowed to the Snake River valley to the northwest. It is observed that the northern towns of Utah all lie along the eastern border of this basin,—the southern ones at a slightly higher level, but, like the others, along the western foot of the Wasatch, which bounds the depression on the east. The map shows all the towns of the state that have more than 1,000 people, with the size in 1910 indicated by the symbols used.

On account of this situation at the border of a great depression in a dry country the name *oasis* is here applied to the state. For oases are essentially hollows in the desert where ground-water becomes available. Probably most minds react to the word "oasis" with a picture of a tuft of palms waving over a pool in the midst of desert sand. It is quite possible that no such pool exists in reality. It is probable that it would be difficult to maintain a pool in such a situation artificially. Oases occur in hollows for the same reason that water appears, in humid regions, when digging a well. The ground-water comes to the surface at the lowest point in its neighborhood [1]

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[1] Readers will find instructive descriptions in E. Desor's "La forêt vierge et le Sahara." Paris, 1879

The word "oasis" is Greek and was applied originally to the hollows in the Libyan Desert of Egypt. Five of these were famous: Siwa, Bakharieh,

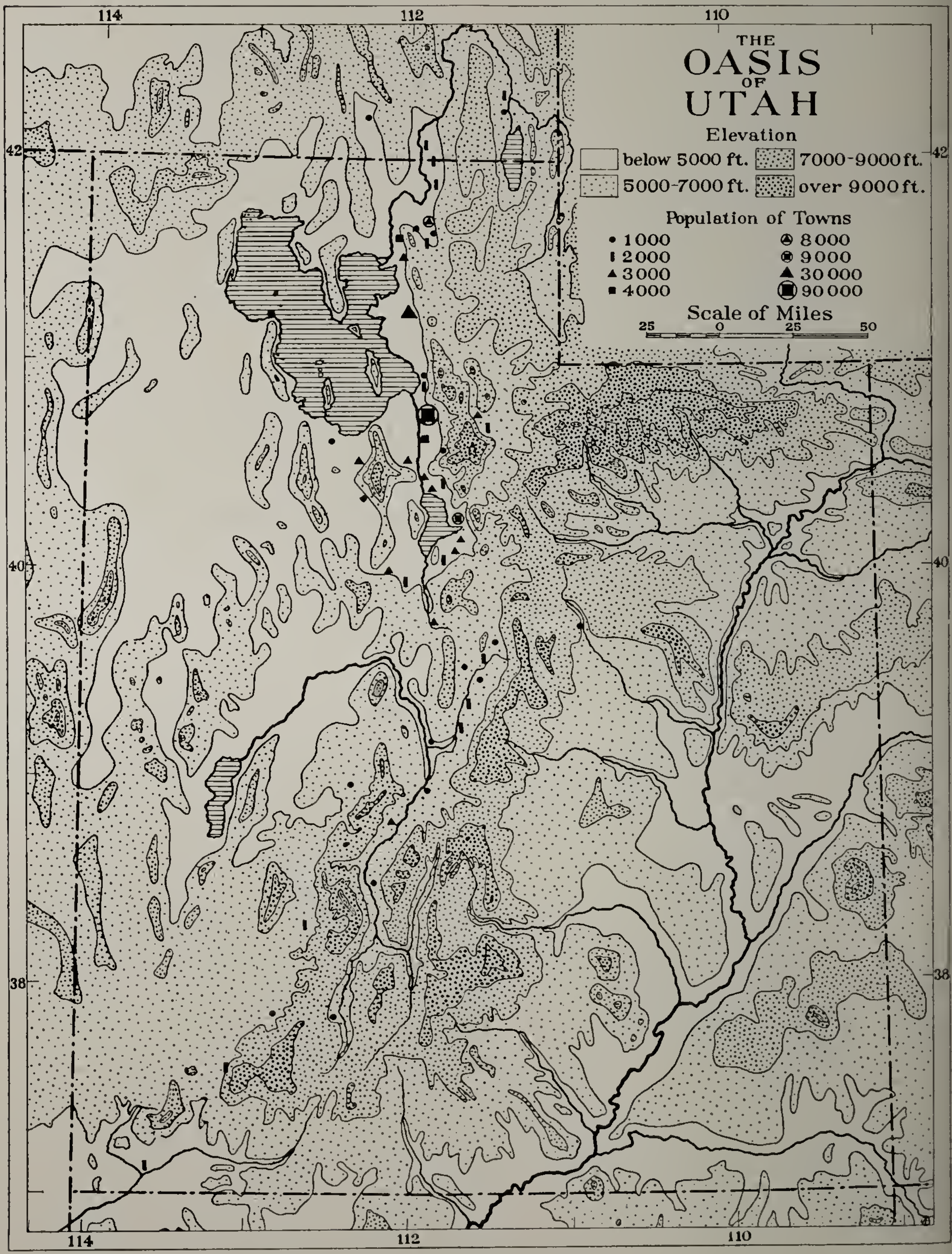

FIG. 1—The oasis of Utah: relief and cities. Scale, 1:4,300,000.

Relief is based on the contour map of the United States, 1:2,500,000, by the U. S. Geological Survey (1914); population of cities is based on the Thirteenth Census of 1910.

Farafra, Dakhel, and Khargeh, from 100 to 300 miles west of the Nile (Fig. 2). All of them, like the Nile flood-plain, are depressions far below the surface level of the desert. They are all that give Egypt its pretended width on the political map, for apart from them the only habitable land—"sown" land—is the long Nile flood-plain, very narrow, at most a nine-mile-wide strip of cultivable land.

They are none of them oases as the word is commonly used in English today. Characteristic is the depth of the oasis floor below the desert and the sharpness of the bounding cliffs, brought out excellently by the view of the Algerian oasis Laghouat from Robin's "La Terre" (Fig. 3). Siwa is 426 feet below the desert; Farafra, 626; Dakhel, 1,059; and Khargeh, 984. Bakharieh is an excellent example (Fig. 4). The desert above it has an elevation of 800-900 feet above the sea; the floor of the oasis itself, at Bawiti, of 367 feet, a difference of over 400-500 feet. The traveler approaches the oasis without suspecting it,—across a stony or sandy level. Of a sudden he finds himself at the brink of a precipice, under which nestles the village, with bordering palm groves and millet fields extending a little farther out on the floor of the depression. Each village is at a spring or well, and the spring is fed by the ground-water of the desert, emerging at the foot of the cliff. There is only water enough to irrigate a small part of the depression. The total area of Bakharieh is 300 square miles, but only six could be cultivated at the time of Rohlfs's expedition (1873-74). From these six square miles the 2,410 inhabitants of Bakharieh drew their sustenance. The name oasis, however, applies to the whole depression, though it contains a number of wells at considerable distances apart and a number of villages. Bakharieh has six inhabited places, Farafra two out of fifteen watered spots, and Khargeh eleven. From the floor of such an oasis the ragged, encircling cliffs look like a low mountain range. Several of them have the name *jebel* (mountain), and Rohlfs's map is marked "Rohlfs Gebirge" to the northeast of the Farafra oasis.[2]

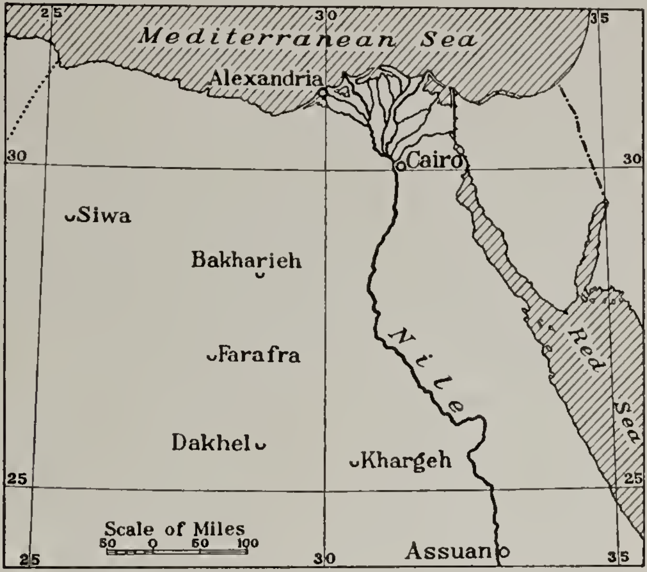

FIG. 2—Location of the five oases of the Libyan Desert, Siwa, Bakharieh, Farafra, Dakhel, and Khargeh, to which the Greek word *oasis* originally applied. Scale, 1:17,500,000.

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[2] The data about the oases are taken from the account of Rohlfs's journey of 1873-74 (Expedition zur Erforschung der Libyschen Wüste, 3 vols., Cassel, 1875-76, Vol. 3: Physische Geographie und Meteorologie, bearbeitet von W. Jordan), because it is still an excellent source of information. Reference should also be had to the reports on the topography and geology of the oases published by the Geological Survey of Egypt (Survey Dept., Cairo), as follows: Bakharieh [Baharia], by John Ball and H. J. L. Beadnell, 1903; Farafra, by H. J. L. Beadnell, 1901; Dakhel [Dakhla], by H. J. L. Beadnell, 1901; and Khargeh [Kharga], by John Ball, 1900. Geographers now have easy access to what little is known of Egyptian geography in the six-sheet Map of Egypt on the scale of 1: 1,000,000 published by the Survey Department at Cairo,

The Utah towns at the eastern border of the Bonneville Basin and the basin itself, 20,000 square miles in area, are here likened to one of these oases of the Libyan Desert, the Wasatch being the eastern portion of the bounding wall. The irrigable land of this oasis of Utah has a population density of 239 people to the square mile, where the Libyan oases have 530 to the square mile of cultivated land,—not too great a discrepancy when the differences in the standards of American and Arab life are considered.

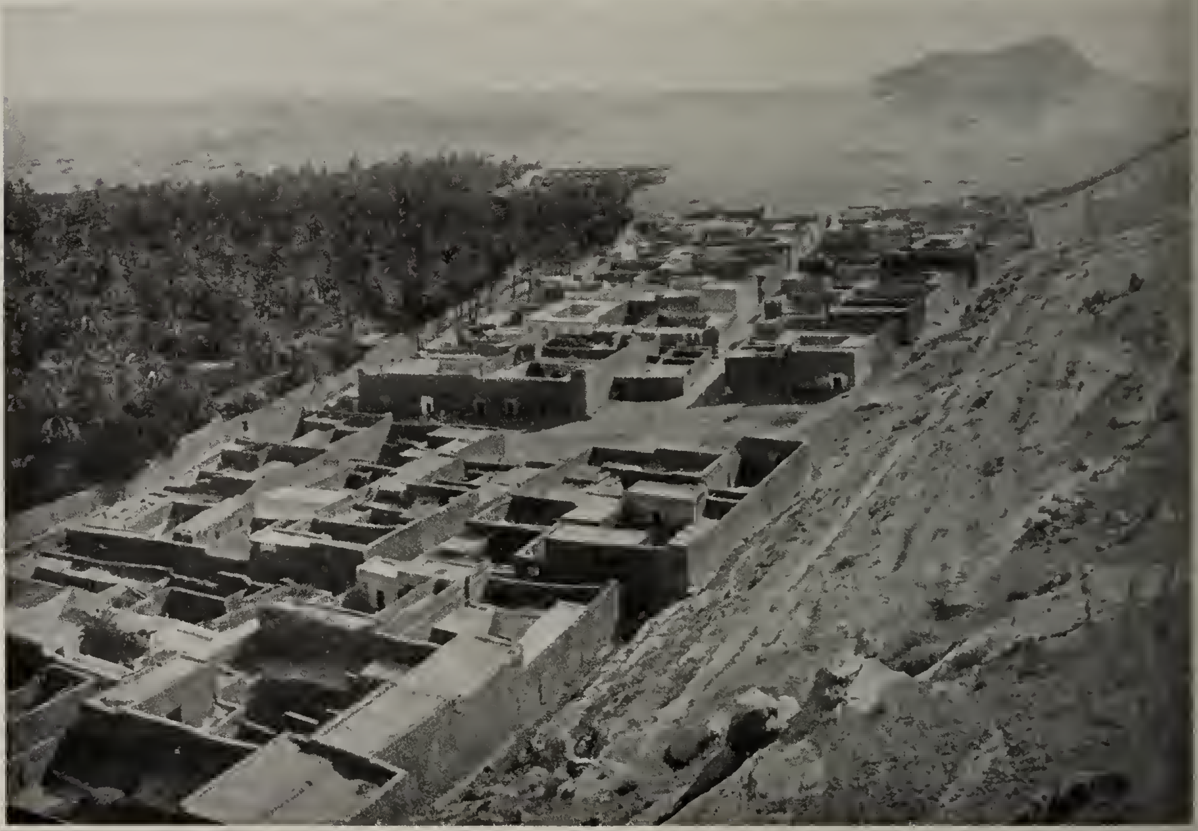

Fig. 3—The Algerian oasis of Laghouat. From Pl. VII, "La Terre: Ses aspects, sa structure, son évolution" by A. Robin, Larousse, Paris, 1902.

This view shows the cliffs, at whose foot lies the typical village with its cultivated area.

But the water of the Utah towns is not from wells and springs. It is stream water from the Wasatch, now well stored in reservoirs and economically applied to the soil. In general, rain comes of some sort of uplift to the air. Thus, mountains in the desert always have some rain from the uplift they give the winds. On the other hand descent warms air and favors evaporation rather than precipitation, and an interior basin has less rainfall because of the fact that air can only enter it by descent. The lowest

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1909. The oases are shown on Sheets 1, Alexandria, and 3, Western Oases, and it is at once perceived that Rohlfs made a highly important contribution to the knowledge of the region. The Selima oasis of Sheet 5, Libyan Desert, was not visited by Rohlfs and is very vaguely depicted. For one thing no elevations are given, but its impressionistic contours show the same depression as in the great oases. The Map of Egypt allows an instructive contrast between the Nubian Desert, east of the Nile, and the Libyan Desert to the west, for all the oases are in the west. The Nubian Desert consists of mountain ridges up to 6,000 feet, with its low places from 600 to 1,500, while the western depressions, as has been shown, run down below sea level. The Nubian Desert abounds in slopes strong enough to wash into a great number of dry stream channels, the desert *wadies*. In these the rare wells occur, but permanently inhabited oases are not shown there.

point in the United States is Death Valley, 220 feet below sea level, and it has less than five inches of annual precipitation. The whole Great Basin region is arid, for the prevailing winds get into it by descent across the Sierra Nevada or the Rockies. This is a matter of general knowledge. It is also certain that the Wasatch has much rain and the Uintas still more. The details are shown on the rainfall map by Henry Gannett (Fig. 5),[3] which gives the Great Basin 10 inches a year, the Wasatch upwards of 20 inches, and the Uintas as much as 40 inches. The local observer at Salt Lake City, A. H. Thiessen, draws a different map (Fig. 6).[4] Mr. Thiessen says "The rainfall of Utah has been accurately measured at many stations in the valleys, and at a few moderately high stations, but none at the highest levels, either in the Wasatch or the Uintas. It varies from 6 to 25 inches annually at points between 2,800 and 7,000 feet, and it is probable that as much as 30 inches or more falls at some places at the higher levels. This great variation is due almost wholly to topography. The stations on the western slopes of the mountains receive more moisture than those on the eastern slopes, and stations near the mountains more than do those on the same slopes but farther away from the base of the mountains; stations at higher levels receive more than those at lower levels, as a rule; but stations at the same level on different sides of a mountain will receive different amounts, the one on the western side usually the more." If gages between 5,000 and 7,000 feet yield 7 to 25 inches of rainfall it is probable that at points toward 12,000 feet more than 30 inches falls. Certainly the mountain rainfall is heavy.

In theory, at least, Utah lies in the belt of westerly winds, and these westerly winds should be adiabatically cooled as they ascend the western slopes and deposit their moisture there. Records of the Weather Bureau appear to show that Salt Lake City has a prevalent *southeast* wind. The invaluable Annual Report of the Chief of the Weather Bureau for 1896-1897, for instance, gives the [illegible]erage of the five years 1891-1895 at Salt Lake City—

2241 hours of southeast wind,
1883 " " northwest "
936 " " south "
888 " " east "
785 " " west "
682 " " southwest "
634 " " north "
561 " " northeast "
3690 hours of N.E., E., and S.E. winds, against—
3350 hours of N.W., W., and S.W. winds.

Such other years as are available appear to show the same feature of easterly winds somewhat distinctly predominant over westerly. However,

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[3] From Pl. 1, *U. S. Geol. Surv. Water-Supply Paper 301.* See also footnote 1 on p. 203 of the writer's article in the March *Review.*

[4] Leaflet entitled "Normal Annual Precipitation for Utah."

Salt Lake City's rainiest months, March, April, and May, had 785 hours of northwest wind to 460 of southeast. By the courtesy of the chief of the division of climatology of the Weather Bureau, Mr. P. C. Day, the writer is able to state that the wind at Salt Lake City seems to be in the northwest

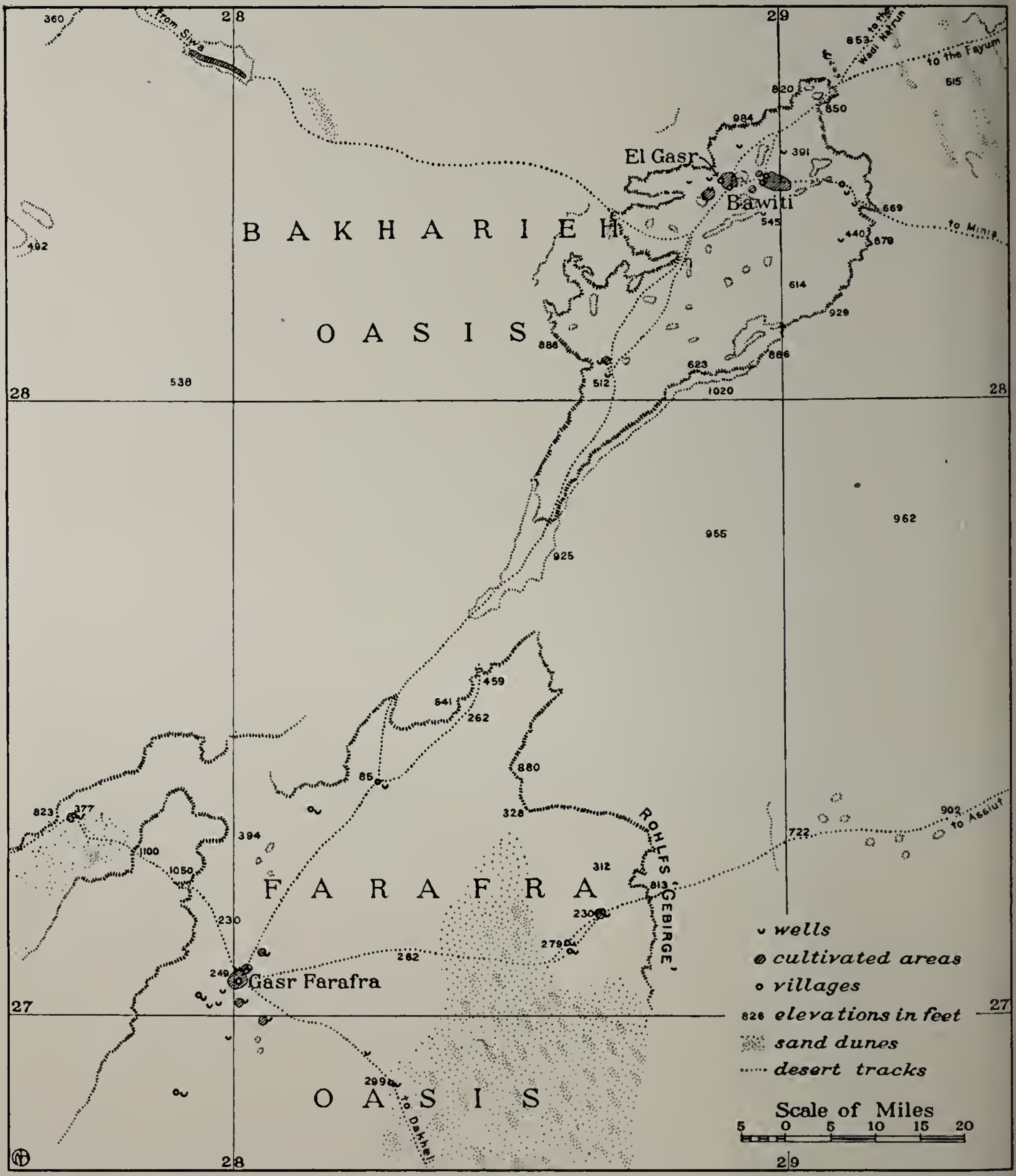

FIG. 4—The oases of Bakharieh and Farafra in the Libyan Desert. Scale, 1:1,540,000. Based on Sheets 1 and 3 of the Map of Egypt, 1:1,000,000, published by the Survey Department, Cairo, 1909 (for the original sources see footnote 2).

during most of the heavier rainfalls. Six of the "more important rainfalls" at that station were October 1 and November 18, 1910, April 5 and September 29, 1911, and May 30 and July 19, 1912. The respective rainfalls were 1.14, 0.70, 0.71, 0.85, 0.49, and 1.07 inches. While these rains were falling, the wind was in the northwest for 27 hours; in the north for 9; southwest, 6; west, 4; south, 4; southeast, 4; and east and northeast for one hour each. To put it another way, the total rainfall on these six occasions was: with a northwest wind, 2.71 inches; with north, 0.70; with southeast, 0.38; with southwest, 0.24; with west, 0.20; with east, 0.20; and with northeast, 0.03. If the six cases selected are at all typical, the northwest is the rain wind. It is puzzling to see the east wind accompanied by the same rainfall as the west wind, though both are small. That the northwest brings the greatest rain may well be because the longest axis of Great Salt Lake stretches in a northwesterly direction from the city. The wind must have a very low humidity when it comes to the lake and must take up much vapor from its surface to drop it again on reaching the mountain slope in the immediate suburbs of the city. But as the lake in turn must draw its waters from the Wasatch streams, it will not do to ascribe more than a part of the rainfall on the range from the evaporation from the surface of the lake. We should expect other stations to have their precipitation with all-west winds. In general the local observers are not able to state what winds prevail when rain falls.

The drainage of the west slope of the Wasatch is mainly caught in streams flowing north and south along the west front or among the western ridges. These are the Bear River flowing northward from Bear Lake into Idaho and then south again into the east arm of Great Salt Lake (which it has turned to fresh water now that the railway has built its causeway across), the Jordan northward from Utah Lake to Great Salt Lake, and the Sevier, which flows north to a point near the middle of the state, where it turns south again to Sevier Lake. Most of the basin of northwestern Utah is quite without running water. It is a surprise to find the eastern portion of the state much better supplied with permanent streams, in view of the greater rainfall on the western slopes called for by theory, and reported by observer Thiessen. In the southeast, where the precipitation is as small as in the west, the Green and Colorado Rivers receive a number of considerable tributaries from the eastern slope of the Wasatch, and these streams appear to carry constant water supplies, although they come from the dry side of the range. Any map of the rivers of Utah shows strikingly this preponderance of running water on the eastern side of the range. Probably the rainfall is not at all sharply limited to the western slopes. It is not good theory to suppose that rain caused by uplift on a west-facing slope will leave the east slopes completely dry. It is to be expected that some rain will pass the crest and feed rivers on the leeward side also. This is observed in the Cascades, the Sierra Nevada, and the Andes of Patagonia. If settlement is limited to the western foot of the Wasatch, it is not wholly on account of superior water supplies, but especially because of the greater amount of level ground with deep soils. The deposits of ancient Lake Bonneville and the wash from the mountains in more recent days have tended to cloak the western foot of the range with a mantle of fine rock

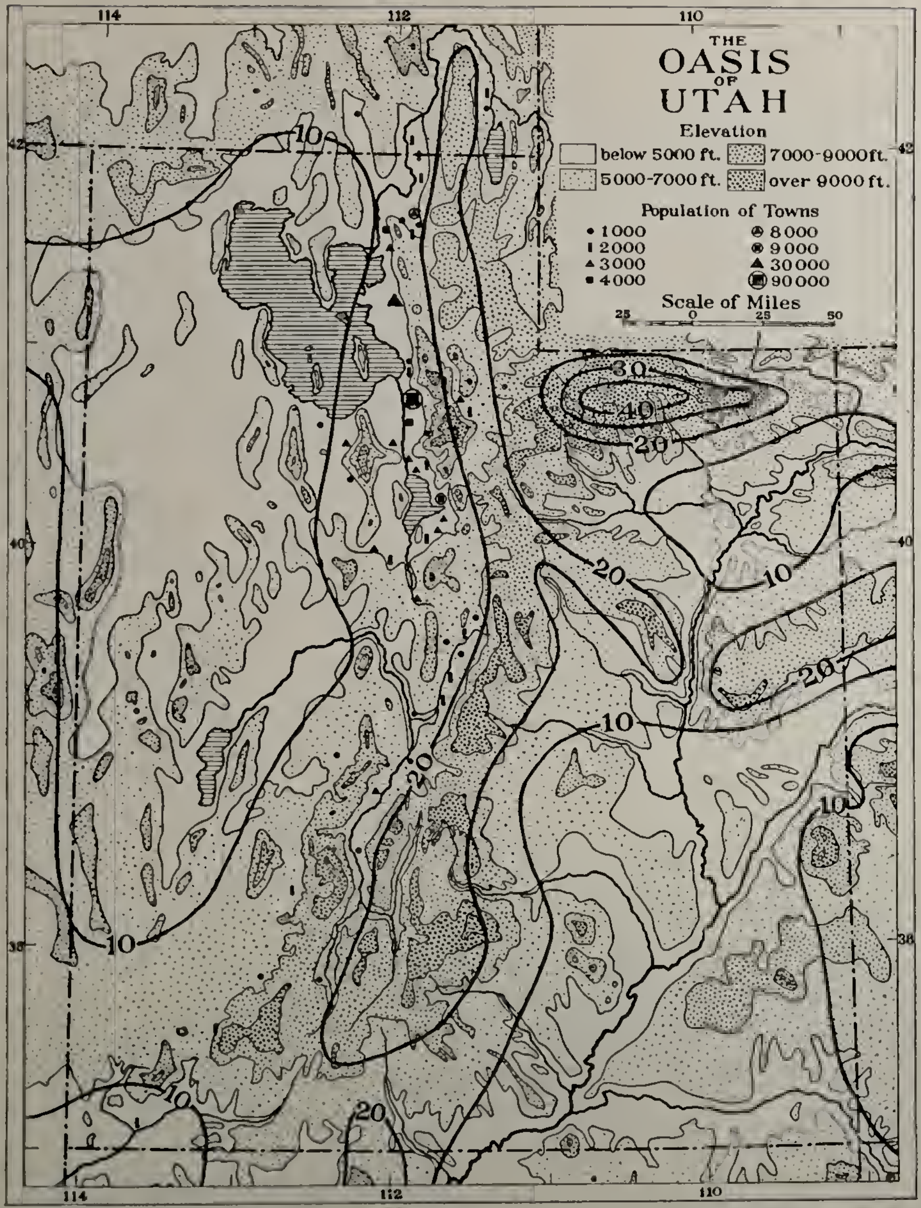

Fig. 5—Mean annual precipitation of Utah, according to Henry Gannett. Scale, 1:5,670,000. Based on Pl. I, *U. S. Geol. Surv. Water-Supply Paper 301*, 1912. Mr. Gannett took the mountain contours and vegetation into consideration

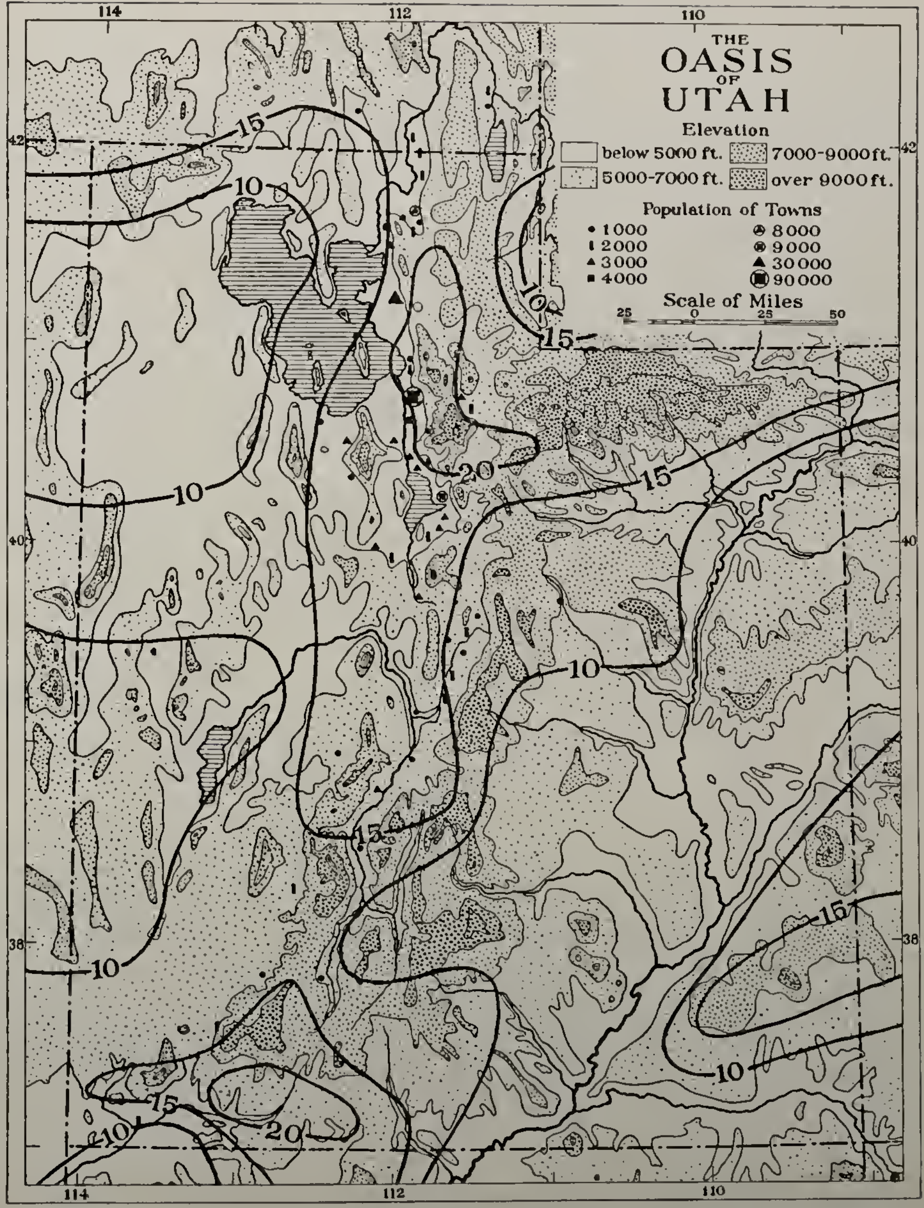

Fig. 6—Mean annual precipitation of Utah, according to A. H. Thiessen. Scale, 1:5,670,000. Based on a leaflet map entitled "Normal Annual Precipitation for Utah," about 1912

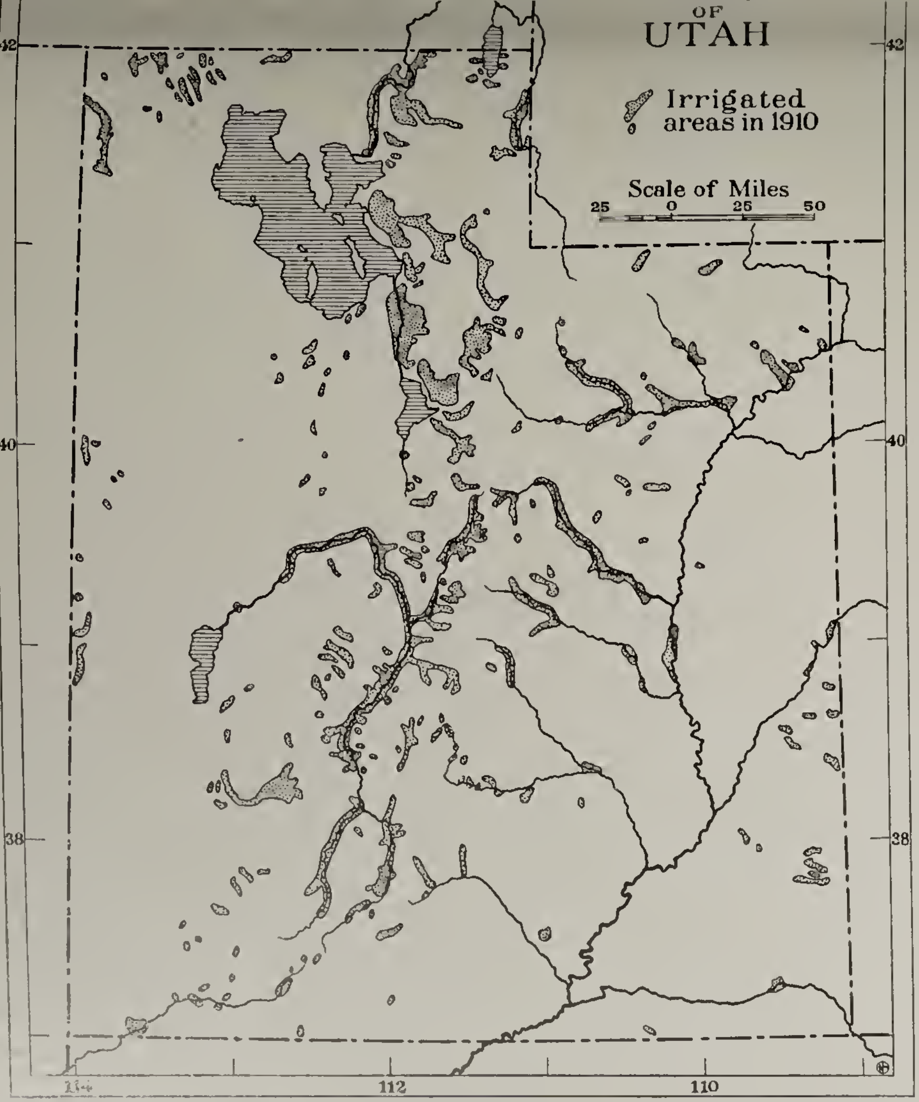

Fig. 7—The irrigated lands of Utah in 1910. Scale, 1:5,670,000. Based on Fig. 2, Pl. [illegible], Statistical Atlas of the United States, Bureau of the Census, 1914.

It is apparent that the irrigated lands lie mainly along the valleys at the west front of the Wasatch, like the cities in Fig. 1.

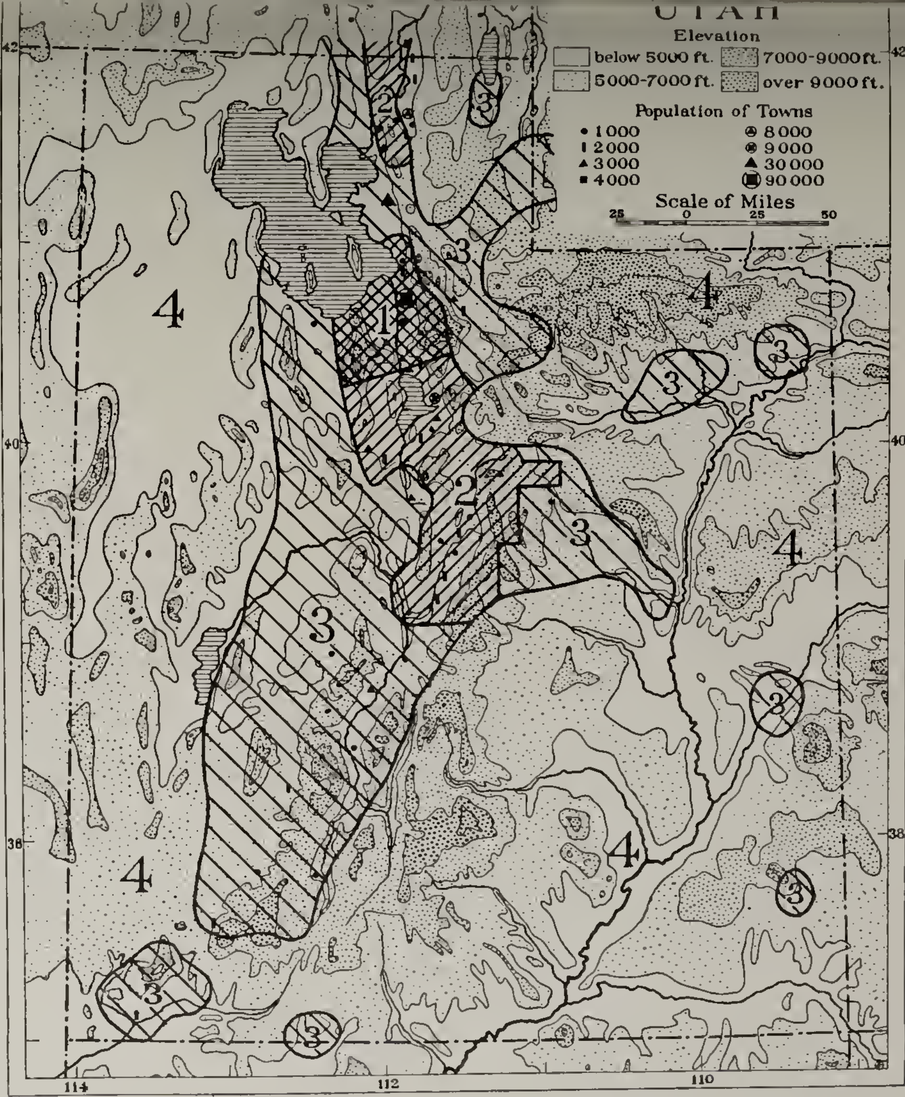

Fig. 8—Distribution of rural population in 1910. Scale. 1:5,670,000. Based on Pl. 15, Statistical Atlas of the United States, Bureau of the Census, 1914.

Note on Fig. 8: All the cities of 2,500 or more inhabitants have been subtracted from the population before computing the densities. Grade (4) has less than 2 people to the square mile; grade (3), from 2 to 6; grade (2), from 6 to 18; grade (1), from 18 to 45. The map shows the main distribution of people along the western front of the Wasatch, but includes some units of absolute desert in area (3).

waste which becomes a fertile soil as soon as water is added to it. The deep canyons of the Green and the Colorado cause the whole eastern region to be deeply dissected. Level expanses are very small there, and the finer waste has been carried off to the sea.

The representation of the settlements of a state by city symbols only, such as we have used here (Figs. 1, 5, 6, and 8), is novel and calls for brief comment. The best-known population maps for the United States are the very beautiful ones published by the Federal Census Bureau. The Utah portion of the map for 1910 is here roughly reproduced in Figure 8, which uses black shading and numbers for the brown shades of the original. The numeral 4 represents areas where the population per square mile is less than 2; 3, from 2 to 6; 2, from 6 to 18; and 1, from 18 to 45. Although the map is quite inadequate to represent the actual distribution of population, it does show that the population is mainly along the western foot of the mountains, with empty spaces westward and only very tiny scattered bits of settlement towards the east. It is inadequate because it represents only the "rural population, omitting all communities of over 2,500 people." The cities, if of 8,000 people, are represented by dots on the original map. They are Salt Lake City, Ogden, and Provo. There remain eleven cities between 2,500 and 8,000 population without representation on the map as the Census draws it, either by shading or dots for cities. These are Brigham, Logan, Park City, Murray, Tooele, Bingham, Lehi, American Fork, Springville, Spanish Fork, Nephi, and Richfield,—in all 34,086 people, nine per cent of the people of the state. Even if the whole population were used, the values obtained by dividing the population of a Utah county by its area are unsatisfactory, for the counties are so large and so often include much uninhabited wilderness that we may not think of their population as grouped evenly over their surface. The omission of these towns from the 1910 map is probably a mistake that arises from the fact that the Census has this decade revised its definition of rural communities as those with less than 2,500 people instead of 8,000, as was the former standard of discrimination. The 8,000 has still been retained, however, as the smallest size of cities to locate on the map with dots proportional to their size, but the population of all cities over 2,500 was subtracted from their counties before computing population density.

The separation of city from country that the Census makes is not justifiable. The rural and urban population are closely related, not merely in their origin but in all the activities of their daily life. The rural occupation of the land, the cutting of forests and putting fields under tillage has made little cities grow up all over the country and made the big ones yet bigger. The form that economic development has taken demands that much work which was formerly done on the farm be now done in cities. This is not merely in the manufacture of agricultural implements—though these are so important that they have made one man's labor on a farm go from sixteen to eighteen times as far as it did fifty years ago—, but in the preparation of food and clothing and sorting and classifying and storing for sale. If you double the rural population in any district it will quickly cause the urban centers near by to more than double, for the country needs the cities as much as the cities need the country. For example, Michigan and Wisconsin in 1870 had between them seven cities of more than 10,000 inhabitants. By 1910 the population of the two states had a little more than doubled, and there were 42 cities of that size! In the whole district of the Great Lakes in the same period, the cities had increased from 28 to 102. It is impossible today to conceive of the country apart from the city, so completely has it lost its one-time independence. They form an organic unit today, the country producing from the soil, but supplying itself with clothing, furnishings, much of its food, and a great variety of mechanisms from the city, which not merely eats the food the country supplies, but is busily engaged in sorting and distributing the products of both city and country to the consumers everywhere, as well as manufacturing them into other forms.

Instead of attempting to represent the actual distribution of people in the country by subtracting the city dwellers from the total population and representing the residue as the real occupants of the land, progress is to be made by constructing city maps in greater detail than have been usual yet and giving their symbols some connotation of size more legible and graphic than the customary methods allow. A map of cities is a map of foci of human activities. If it can be given a note of relative magnitude in the very symbols that locate the towns, such a map will express admirably the intensity with which men have occupied the ground. A little city must be little at a glance and a big one, big.

No use of type conveys the idea well enough, and the names themselves mask the expression of the map too much to be tolerated. If names must be added a key map should be made for the purpose. A little spot and a big one go some distance toward the expression desired, but only a few sizes can be thus discriminated. The solution is to aid the suggestion of size with that of *shape*. The device used here simply calls for counting corners, a little dot for a thousand, an elongated one for 2,000, a triangle for 3,000, a square for 4,000, an open circle for 5,000. The same symbols, enclosed in a circle, express the next four grades. Practice shows that the eye instantly distinguishes these values. A second size of symbols for cities ten times as large and running through the whole scale renders close size indication possible. The thought is throughout that the cities crown the agricultural occupation of the land and must multiply and must grow in size as more and more land is brought into occupation, or even as cultivation becomes more perfect and more intense. The spacing of the little cities is fixed by the extent to which country areas are improved, and the spacing of great ones is found to depend closely on the spacing of the smaller ones. It is for this reason that the map of Utah's irrigated lands accords so closely with that of her cities.

The scene that unfolded itself before Brigham Young's eyes that July morning in 1849, as he emerged from the pass in the Wasatch above the prairies green with the waters of the mountain creeks, had promise for him of homes for his faithful followers, but it contained also the germ of the unique group of cities and towns strung along the mountain foot today.

THE ERUPTION OF YAKE-DAKE, JAPAN, IN 1915

By SIDNEY POWERS, Ph.D.

The "festoon islands" of Japan form a portion of the girdle of volcanoes which encircles the Pacific. Of the 165 volcanoes which have been found in Japan, 54 are classed as active. These volcanoes can be grouped into a number of volcanic lines, of which the one stretching from Fuji-yama southward through the Bonin Islands is one of the most conspicuous. It is on this line, north of Fuji-yama (Fig. 1), that Yake-dake is situated, in the midst of the Japanese Alps, a granite range of mountains 7,000 to 10,000 feet in height. Within ten miles of Yake-dake there are two quiescent volcanoes, Norikura-dake and Kasa-dake.

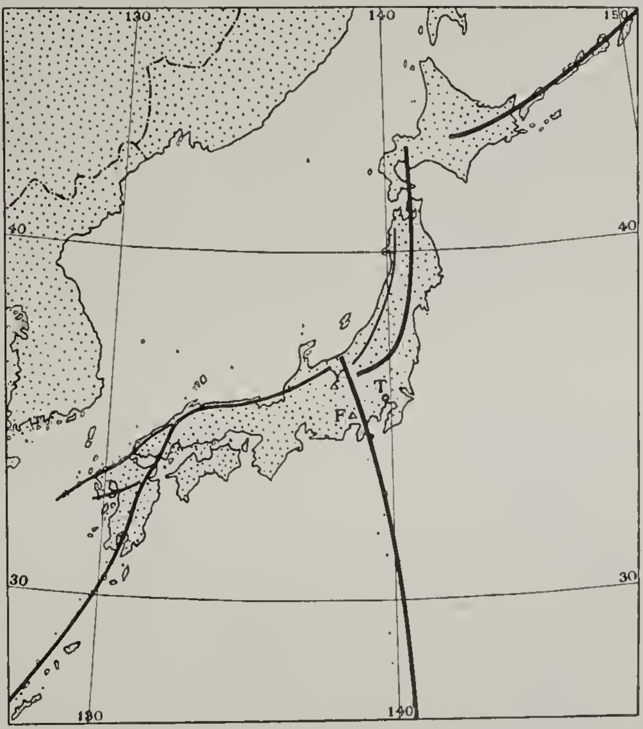

FIG. 1—Outline map of Japan showing the position of Yake-dake (Y) with respect to Tokyo (T) and Fuji-yama (F). Scale, 1:32,000,000. The principal volcanic lines are shown, based on a map in Ishizu's "The Mineral Springs of Japan," Tokyo, 1915 (see March *Review*, p. 239).

An eruption of Yake-dake, accompanied by a fall of ash over the surrounding region and a mud-flow, partly blocking the Azusagawa River, took place on June 6, 1915. In August the writer visited the mountain during a trip to the Orient for the purpose of studying volcanoes and was able to gather the following information concerning the eruption.

Yake-dake is 125 miles northwest of Tokyo and is reached from the city of Matsumoto, 150 miles from Tokyo by rail. From Matsumoto a wagon called a *basha,* a sort of springless "one-horse shay," is taken for 13 miles to a settlement called Shimashima, and from there it is necessary to walk with one's "boy" (interpreter) over the Tokugo Pass of 7,000 feet elevation into the valley of the Azusagawa River to a small inn at Kami-kochi, a distance of about 19 miles. This inn is situated near a hot spring at an elevation of 4,900 feet in a V-shaped valley where snow persists in large quantities in the ravines throughout the year.[1]

From Kami-kochi the volcano, rising to a height of 8,000 feet, is three miles away. It is a steep-sided mountain with a rounded top, composed of coarse-grained andesite. Smoke issues from the crater near the summit and from the newly opened crater on the east side. There are two summits, each composed of massive andesite, and between them are two craters, one of which is quiescent, the other emitting steam in large quantities. The recent eruption as witnessed from Kami-kochi is described by J. M. Davis as follows:

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[1] This general region has been described by the Rev. Walter Weston in an article entitled "Exploration in the Northern Japanese Alps," *Geogr. Journ.*, Vol. 46, 1915 (Sept.), pp. 188-200.

Earthquake shocks with increasing intensity were felt at 7 o'clock on the morning of June 6. A strong concussion was felt as the volcano was split open on the east side from the base to within 1,000 feet of the top. The explosions hurled out rocks, ashes, mud, steam, and smoke with a tremendous reverberation of sounds, as the massive granite cliffs on the opposite side of the valley are only a mile away. Ashes fell at Kami-kochi, and the whole valley was enshrouded in a heavy cloud of smoke. The activity continued all day with frequent earthquake shocks, the roar of escaping steam, and the crash of falling trees and rocks. A row of new craters was opened along the new fissure, the principal crater being at an elevation of 7,000 feet. The ash and mud broke all the branches of the trees in the neighborhood, and a large mass of mud and boulders slid down the steep slope into the valley below, damming the stream.

Toward evening of the first day a heavy rain began to fall and continued all the next day. Minor explosions from the craters continued also throughout the second day, and more landslides took place. No further information is available, as it was quite impossible for the writer to secure satisfactory information from the natives about this or any other Japanese volcano, partly because the interpreters were not familiar with volcanic activity, but principally because the natives have no interest in volcanoes, even those near by.

An examination of the mountain in August showed a row of small craters at the upper end of the newly formed fissure. These craters were arranged along the fissure, with several small pits in each depression. With the exception of those in the uppermost crater, the pits were inactive, and many were filled with water. The upper crater was about 100 feet long and 30 feet wide at the base, with a wall toward the mountain rising 300 feet and a ridge on the lower side between this and the next crater 70 feet high. Steam was rushing with a hissing sound from a hole ten feet in diameter in the upper crater and sweeping up toward the top of the mountain as seen in Figure 2. The sides of the craters and the surrounding region were covered with gray mud, which was at least three feet thick at the upper crater. The trees on the sides of the mountain were all killed, but some of them were killed by an eruption "about 28 years ago." A quarter of a mile below the main crater, the ash covering the fissures running down the mountain was one foot thick, and at the Kami-kochi inn it was one-eighth of an inch thick. Steam was issuing in many places from the fissures below the summit crater.

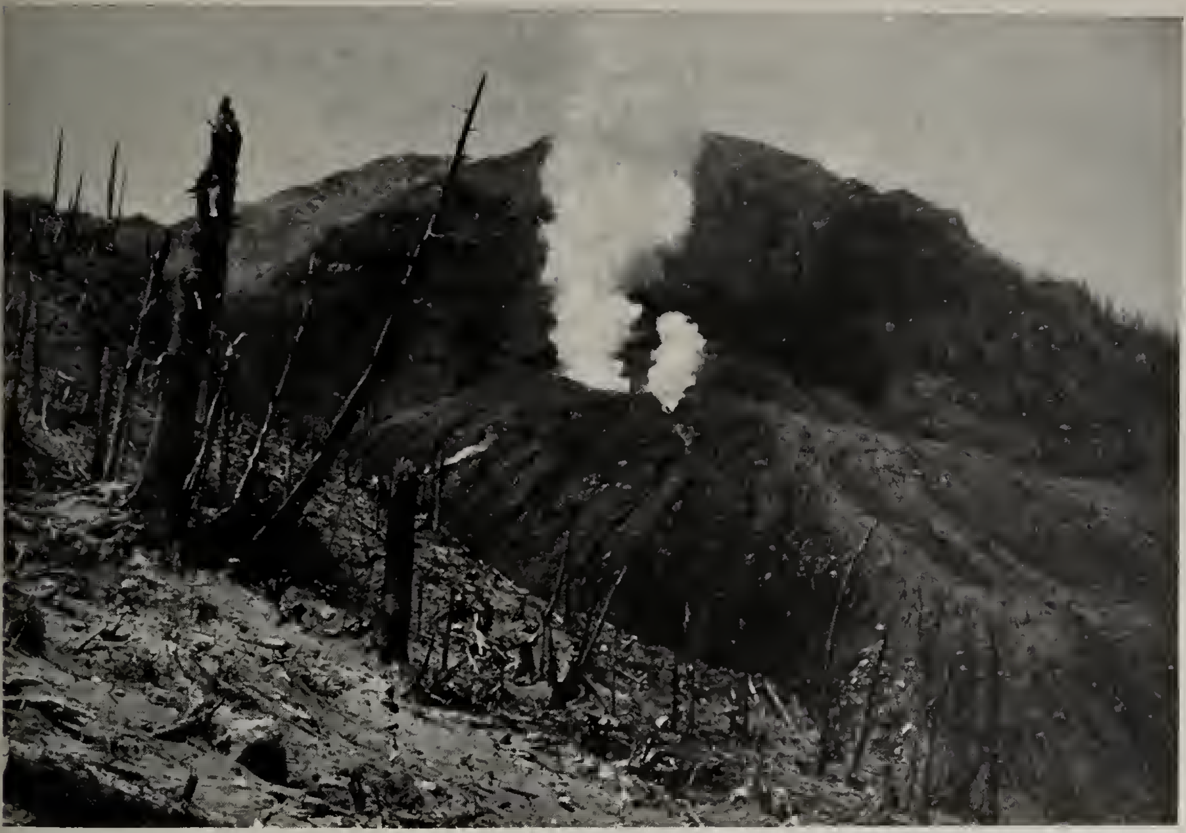

FIG. 2.

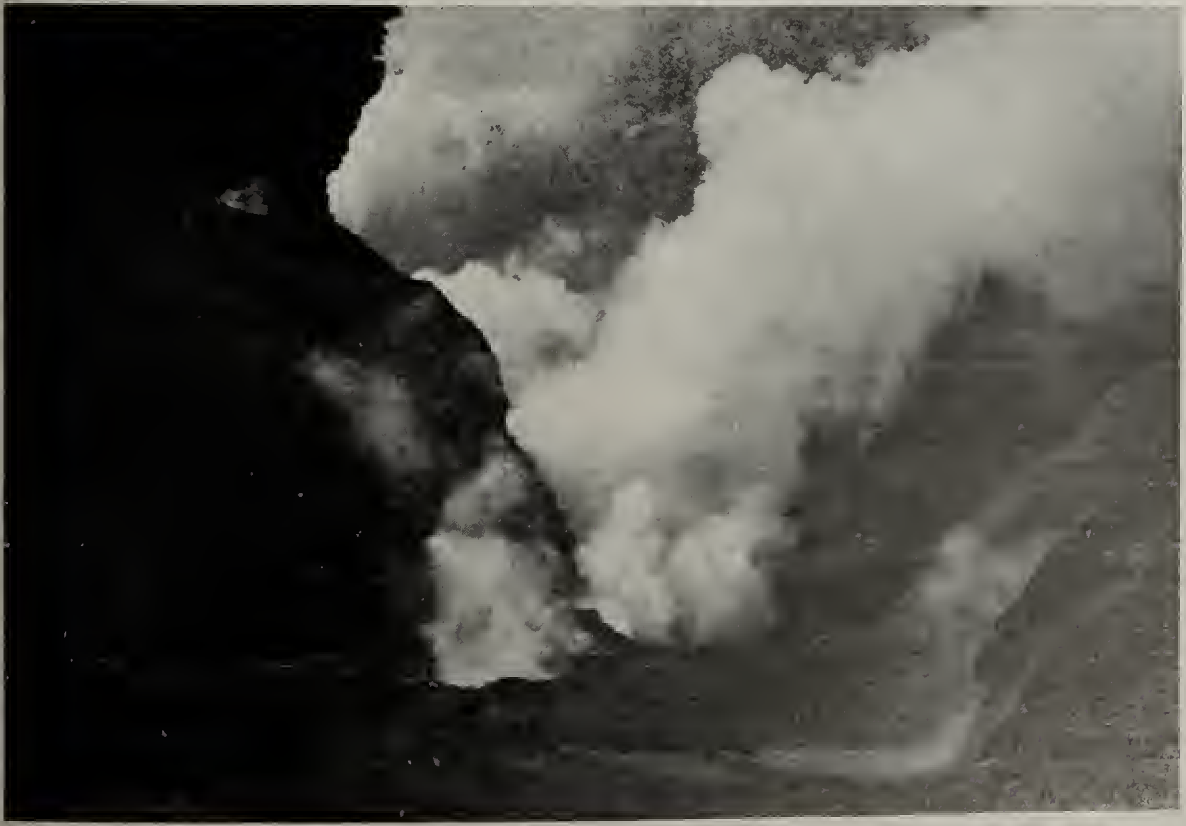

FIG. 3.

FIG. 2—The new crater of Yake-Dake, looking toward the summit of the mountain. The steam comes out of a hole about ten feet in diameter. The mud-flow which dammed the Azusagawa River started from the slope on the right.

FIG. 3—The main crater shown in Fig. 2, taken from the base of the newly opened fissure which extends down the mountain.

The damming of the Azusagawa River by a mud-flow has formed a temporary lake (Fig. 4), half a mile in length, but of no great depth. The stream is rapidly wearing down the obstructing débris, and in relatively few years only a marsh will remain. There is no new lava in the material which slid down the mountain, and no bombs indicative of fresh lava were observed anywhere on the mountain, so the eruption may represent merely a series of steam explosions such as caused the destruction of the mass Ko-Bandai of the volcano Bandai San in 1888.

In regard to the previous history of the volcano, Milne[2] reports that it was active in 1875, but the Japanese students at Kami-kochi know of only two previous eruptions, one between 28 and 33 years ago, in which the steaming crater at the summit of the mountain was formed, and the other about 100 years ago, in which the extinct crater at the summit was blown out. The original form of the mountain is not easy to determine on account of the extensive erosion which has taken place. There appear to be solid masses of andesite at the two summits, which are now separated by two craters, and, if these masses were originally continuous, the form would suggest a volcanic dome similar to O-Usu at the volcano Usu-dake in Hokkaido (Yezo). The summits of the other Japanese volcanoes visited differ from Yake-dake in being composed principally of ash lapilli and bombs.

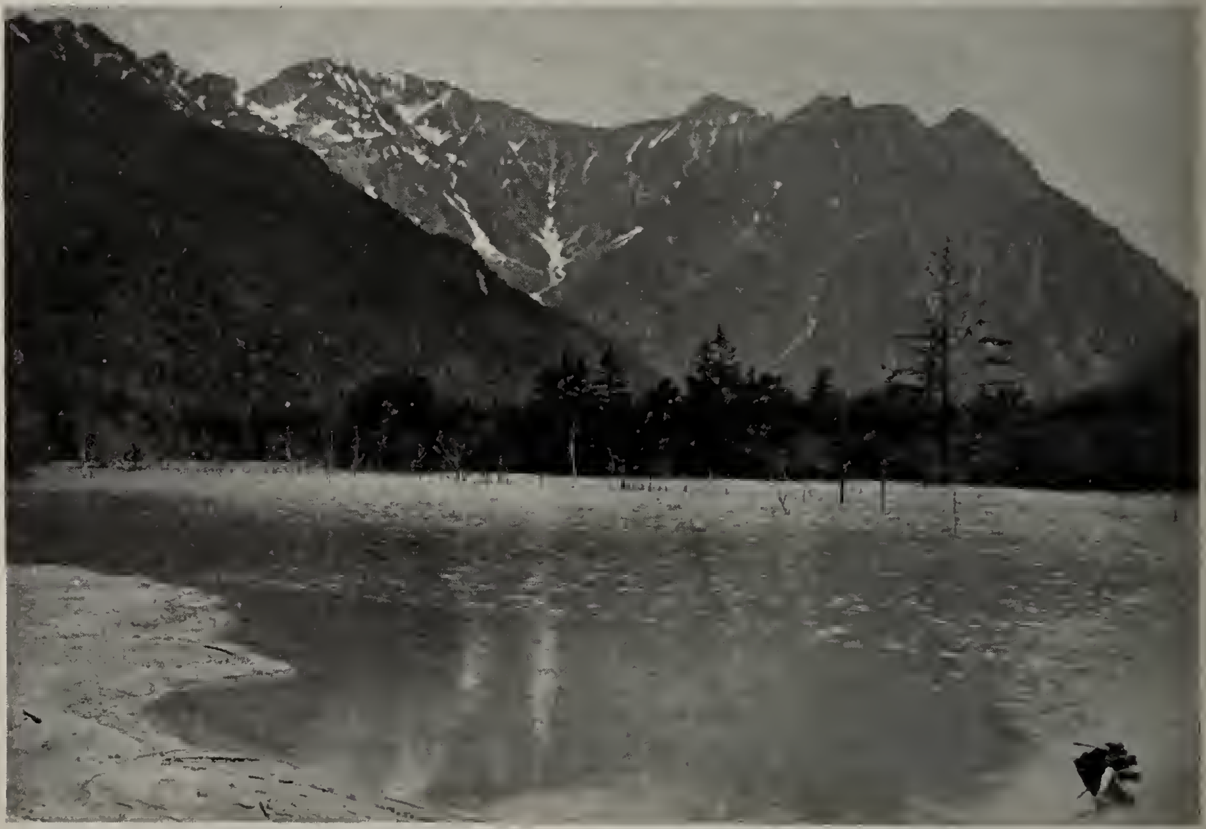

Fig. 4—The new lake formed by a mud-flow damming the Azusagawa River. The mountain in the distance is Hodaka-dake, and near its base is the hot spring and inn Kami-kochi. The snow remains in these valleys all summer, for the elevation of the lake is about 4,900 feet and the top of Hodaka-dake is 10,250 feet.

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[2] John Milne: The Volcanoes of Japan, *Trans. Seismol. Soc. Japan*, Vol. 60, 1886.

THE NATIONAL COUNCIL OF GEOGRAPHY TEACHERS

There has been a growing feeling among teachers that there should be an organization devoted to advancing the teaching of geography. As a result of discussion at the meet-ng of the National Education Association in 1914, and of extensive correspondence, the desirability of forming such an association, together with a general plan of organization, was presented to the Association of American Geographers at their Chicago meeting in December, 1914, and met with their hearty approval. Professors R. E. Dodge, R. H. Whitbeck, and C. R. Dryer were delegated as a committee to co-operate with those who had taken the initial steps. This committee was enlarged to include Professors L. O. Packard, Charles C. Colby, and George J. Miller, and thereupon proceeded to seek the co-operation of others in creating the National Council of Geography Teachers.

The first meeting of this committee was held in Chicago in December, 1914, and the general plan of organization was decided upon. It was the opinion of the committee that the greatest immediate good could be accomplished by securing the co-operation of leaders in each state who would assume the responsibility of organizing a state council of geography teachers. Representatives from each state council could then constitute the board of directors of the national council. In accordance with this plan the committee requested a geographer in each state to organize a state council. In those states in which no geographer was known to the committee the state department of education or the state university was requested to recommend someone to take charge of the work.

The hearty response from all parts of the United States was most encouraging. In some states officials of the state department of education or a city superintendent have assumed the responsibility of organizing an association of geography teachers. This indicates a keen appreciation among school officials of the need for such an organization and of the splendid opportunity to do constructive work. Leaders have been secured in thirty-eight states (see map), and the enthusiasm and prompt activity of many has been most encouraging. Sixteen leaders have completed organizations in their respective states (Ohio has been added since the map was prepared). In nearly all these states meetings have been held and programs have been given. The attendance at these first meetings has been very gratifying, varying from a dozen to more than 350. Ten other leaders report (to date) that their state organization will be complete within a year. It is likely, therefore, that by the end of another year state councils of geography teachers will be actively at work in nearly three-fourths of the states. In some states local societies have been formed, e. g. the Bay Council of Geography Teachers in California and the Minneapolis and St. Paul Associations in Minnesota. In several other states local organizations of a geographic character but not emphasizing the teaching phase of the subject were already in existence.

In most states the organization of geography teachers has been established as an independent association but affiliated with the state teachers' association and meeting with it. In some states it is a section of the larger teachers' association, and in others it is a part of the state science association. Organization as a part of the state teachers' association or affiliation with it seems to be the more desirable plan. Either of these plans enables the geographers to interest a much larger number of teachers and school officials, to carry their influence more completely throughout the state, to increase the funds available for constructive work, to lessen the number of separate meetings, and to make available the enthusiasm of larger numbers.

Work of great value can be accomplished by each state organization. Within a few years there should be a council of geography teachers in every state and it should undertake some definite task, the completion of which will advance the teaching of geography in the schools of that state. The Bay Council of Geography Teachers of California ha already undertaken such a task. They are now at work on "Materials and Methods o Map Work in the Grades and High Schools." The Minnesota state association will undertake the preparation of a course of study for the elementary schools of the state. It i probable that other associations are planning work of similar type.

By the generous co-operation of the publishers of the *Journal of Geography* tha journal has been made the official organ of the National Council and will be include with the annual dues of one dollar. In addition the American Geographical Society ha tendered assistance of great value. This society publishes in its monthly magazine, th *Geographical Review*, articles of inestimable value to every teacher of geography. Fro time to time appropriate articles will be sent to each member of the National Counci of Geography Teachers. Membership fees may be sent to the Treasurer, Mr. Verno

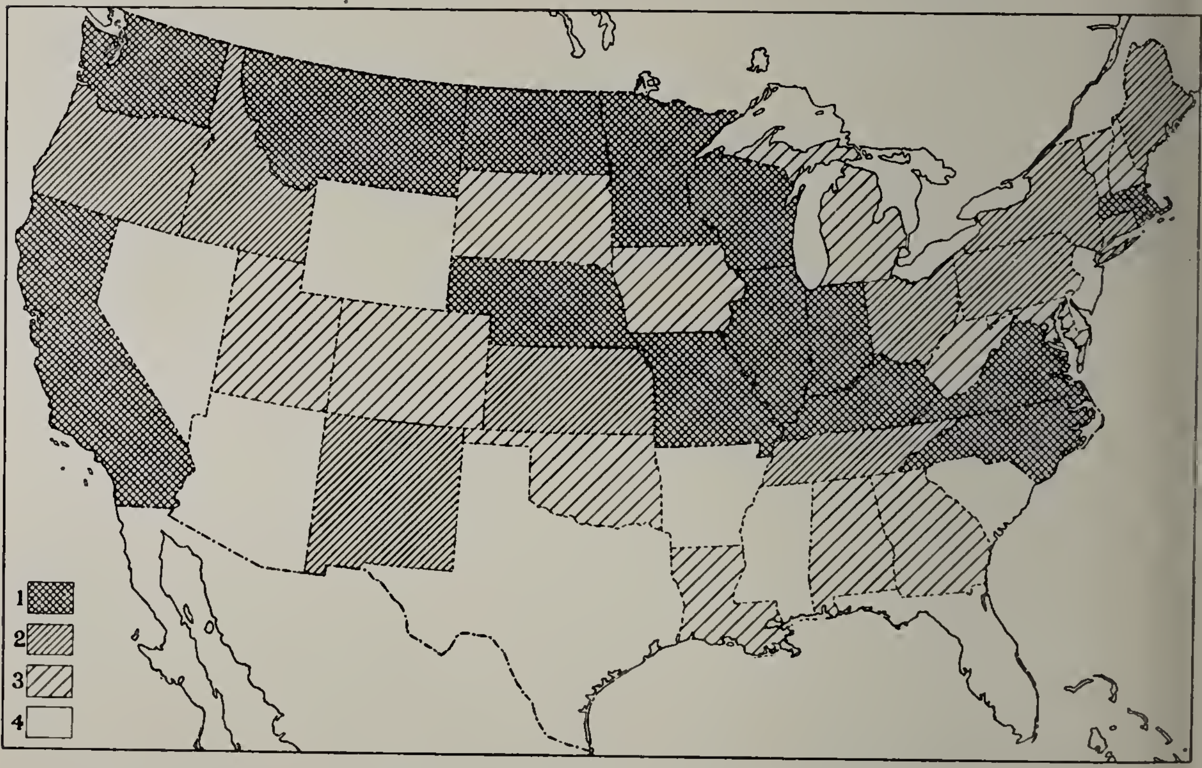

FIG. 1—Progress in organization of state associations of geography teachers during 1915.

1—State organization completed (Ohio has been added since the map was prepared).

2—State organization will probably be completed in 1916.

3—Leaders have been appointed.

4—No leader secured.

C. Finch, University of Wisconsin, Madison, Wis. Probably no other association of teachers offers so much of value to its members for so small a fee.

The final plan of organization of the National Council of Geography Teachers was worked out at the meeting in Washington in January of this year. The constitution provides for a Board of Directors, an Executive Committee, and executive officers. The Board of Directors consists of fifty members made up of (a) representatives of the affiliated associations of geography teachers, and (b) members at large. The Executive Committee consists of nine members, three of whom are to be chosen annually, and the executive officers are a president, two vice-presidents, a secretary, and a treasurer. The administration of the affairs of the Council are in the hands of the Executive Committee and the executive officers.

The officers chosen for the year 1916 are as follows: President, Richard E. Dodge, Teachers College, New York City; First Vice-President, Albert P. Brigham, Colgate University, Hamilton, N. Y.; Second Vice-President, Charles R. Dryer, Fort Wayne, Ind.; Secretary and Chairman of the Executive Committee, George J. Miller, State Normal School, Mankato, Minn.; Treasurer, Vernor C. Finch, University of Wisconsin, Madison, Wis.

The Executive Committee consists of the following:

George J. Miller, State Normal School, Mankato, Minn.; Richard E. Dodge, Teachers College, New York City; Charles R. Dryer, Fort Wayne, Ind.; R. H. Whitbeck, University of Wisconsin, Madison, Wis.; L. O. Packard, Boston Normal School, Boston, Mass.; James F. Chamberlain, State Normal School, Los Angeles, Cal.; Charles C. Colby, Peabody College for Teachers, Nashville, Tenn.; F. V. Emerson, University of Louisiana, Baton Rouge, La.; N. A. Bengtson, University of Nebraska, Lincoln, Nebr.

The Board of Directors consists of the following: Jane K. Atwood, State Normal School, Emporia, Kan.; George A. Barker, State Teachers College, Greeley, Colo.; N. A. Bengtson, University of Nebraska, Lincoln, Nebr.; C. T. Boggess, State Normal School, West Liberty, W. Va.; Dr. Isaiah Bowman, Director, American Geographical Society, New York City; Robert M. Brown, State Normal School, Providence, R. I.; J. E. Buchanan, State Normal School, Cheney, Wash.; E. J. Cable, State Teachers College, Cedar Rapids, Ia.; Frank Carney, Denison University, Granville, O.; James F. Chamberlain, State Normal School, Los Angeles, Cal.; W. W. Clendenin, Wadleigh High School, New York City; Dr. Collier Cobb, University of North Carolina, Chapel Hill, N. C.; C. C. Colby, Peabody College for Teachers, Nashville, Tenn.; Sumner W. Cushing, State Normal School, Salem, Mass.; President C. W. Daugette, State Normal School, Jacksonville, Ala.; Dr. F. V. Emerson, University of Louisiana, Baton Rouge, La.; O. W. Freeman, Fergus County High School, Lewiston, Mont.; Grant E. Finch, State Normal School, Dillon, Mont.; R. P. Green, State Normal School, Bowling Green, Ky.; Dr. R. S. Holway, University of California, Berkeley, Cal.; Mark Jefferson, State Normal School, Ypsilanti, Mich.; President Willis E. Johnson, State Normal and Industrial School, Aberdeen, S. Dak.; Loulie C. Kelley, John Marshall High School, Richmond, Va.; Frank Merrill, State Normal School, Athens, Ga.; L. O. Packard, Boston Normal School, Boston, Mass.; Dr. A. E. Parkins, University of Missouri, Columbia, Mo.; E. E. Philbrook, State Normal School, Castine, Me.; C. J. Posey, University of Minnesota, Minneapolis, Minn.; C. E. Pratt, State Normal School, New Britain, Conn.; Ernest E. Race, State Normal School, Baltimore, Md.; Joseph Reed, State Normal School, Lewiston, Idaho; Dr. G. B. Roorbach, University of Pennsylvania, Philadelphia, Pa.; Dr. R. D. Salisbury, University of Chicago, Chicago, Ill.; B. H. Schockel, State Normal School, Terre Haute, Ind.; Howard E. Simpson, University of North Dakota, Grand Forks, N. Dak.; Bolton Smith, Memphis, Tenn.; James Smith, Austin High School, Chicago, Ill.; Dr. Warren D. Smith, University of Oregon, Eugene, Ore.; Mabel Stark, State Normal University, Normal, Ill.; C. H. Taylor, University of Oklahoma, Norman, Okla.; Alice Wessa, State Normal School, Buffalo, N. Y.; R. H. Whitbeck, University of Wisconsin, Madison, Wis.; G. H. Whitcher, State Department of Education, Concord, N. H.; Alvan N. White, State Superintendent of Education, Santa Fe, N. Mex.; W. H. Young, Superintendent of Schools, St. Johnsbury, Vt.; Anna Youngberg, University of Utah, Salt Lake City, Utah.

The purpose of the National Council, as stated in its constitution, is to increase the effectiveness of geography teaching in the schools of America. It therefore wishes to do everything possible to assist state or local associations. The Secretary will appreciate any suggestions that have as their object the bettering of geography teaching, or suggestions of ways in which the National Council may be of assistance. He will be glad to receive the names and addresses of teachers who are interested in geography.

George J. Miller.

THE THIRD JOINT MEETING OF THE AMERICAN GEOGRAPHICAL SOCIETY AND THE ASSOCIATION OF AMERICAN GEOGRAPHERS

The third joint meeting of the American Geographical Society and the Association of American Geographers was held in New York on April 14 and 15. The sessions occupied Friday morning and afternoon, April 14, and Saturday morning, April 15, and were held at the Hispanic Society, in the same quadrangle as the building of the American Geographical Society. The meeting was called to order on Friday morning by President Greenough. Vice-President J. Russell Smith of the Association presided. The program consisted of a limited number of longer papers of general interest, with ample time for discussion. Following is a list of titles and speakers:

Leon Dominian: The Geographic Foundation of Turkey's World Relations.
Mary Verhoeff: The Kentucky River in Relation to the Kentucky Mountains.
Henry B. Bigelow: Oceanographic Explorations off the East Coast of the United States.
H. C. Taylor: Economic Factors Influencing the Geographical Distribution of Crops and Livestock in the United States.
A. Hamilton Rice: Explorations in the Northwest Amazon Valley.
Albert P. Brigham: The Physiographic Provinces of New York State.
Harrison W. Smith: Personal Experiences in the Society Islands and Borneo.
Ernest P. Goodrich: Some Geographic Problems Incident to the Growth of a Great City—New York.

Miss Verhoeff's paper dealt with the anthropogeography of the Kentucky River basin, with special reference to the history of settlement. This study is an outgrowth and continuation of her previous investigations along similar lines (The Kentucky Mountains: Transportation and Commerce, 1750 to 1911, *Filson Club Publs. No. 26*, Louisville, 1911; reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, p. 779); it will be published in the same series in complete form.

Doctor Bigelow gave an account of the oceanographical work of the U. S. Bureau of Fisheries in the Gulf of Maine—the name given to the embayment of the Atlantic enclosed between the peninsulas of Massachusetts and Nova Scotia. Although this appropriate term to designate a distinct section of our Atlantic waters has been employed on U. S. Coast and Geodetic Survey charts at least as early as 1864 (Cape Sable to Sandy Hook, 1:1,200,000; and Chart No. 1,000, 1908), and is commonly accepted on the Continent (see Pl. 200-201, Andree's Hand Atlas, 6th edition, 1914), it is only recently coming into general use among American geographers (see also G. C. Curtis' use of it in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 413, and map between pp. 420 and 421).

The suggestive feature of Doctor Taylor's paper was a series of diagrams illustrating "crop competition." A set of vertical heavy black lines resting on a horizontal line represented the number of hours devoted each day at the place of observation to the cultivation and harvesting of a given crop, the height of the vertical lines being made proportional to the number of hours of cultivation and the horizontal line representing the time progression. By selecting typical localities and applying the device to the staple crops of the region, the diagrams thus showed at a glance which crops could be "dovetailed" to insure the best distribution of labor and the most rational form of mixed farming.

Doctor Rice's paper dealt in a most interesting way with his pioneer exploration and survey of the Inirida, Içana, and Uaupes Rivers in a region which, up to the time of his surveys, had been quite unknown to science. Doctor Rice had already announced his results to the members of the Royal Geographical Society (see his addresses published in Vols. 35 and 44 of the *Geogr. Journ.*), but it had not before been the pleasure of an American geographic audience to hear his latest report.

Professor Brigham presented an original subdivision of New York State into physiographic provinces. His map was strikingly similar to the New York section of the United States map prepared by the Association's Committee on Physiographic Provinces (see the note in this number under ''Geographical Record''). Professor Fenneman pointed out in discussion that this similarity to a map independently constructed tended to confirm the committee's results.

Mr. Goodrich's paper contained abundant material for the study of that most complex and concentrated unit of human geography, the city. The speaker projected on the screen a series of maps by the Committee on the City Plan (whose report is noticed in this number under ''Geographical Publications''), which represented such topics as the percentage of area covered by buildings; population density; ''night'' and ''day'' population, illustrating daily migration from the residential to the business districts and back; transportation; ''time zones,'' or isochronic belts, showing for any given section of the city the time it takes to reach the center; etc.

In addition to the announced papers Prof. Nevin M. Fenneman spoke briefly on the map of the physiographic provinces of the United States, prepared by a committee of the Association, detailed reference to which is made elsewhere in this number. It was also announced that, in connection with the work of the committee, the U. S. Geological Survey had decided on a new policy of officially recognizing physiography in its publications. In the past the references to this subject, incidental and subsidiary, have not been scrutinized by a specialist. Henceforth they will be edited by a physiographer and receive as careful attention as the sections devoted to other phases of geology.

As in previous years, there was an exhibition of maps at the American Geographical Society's building. The subjects illustrated were economic geography and the European war. On Friday evening, Dr. E. L. Stevenson, Acting Director of the Hispanic Society, spoke informally on ''Some Early Maps and Their Geographical and Historical Significance,'' illustrating his remarks with specimens from the rich collection of the Hispanic Society.

At the social gathering of the Association members on Thursday evening at the Park Avenue Hotel, various topics of general interest were brought up, including the desirability of accelerating the production of the topographic map of the United States. Without criticizing the admirable work of the U. S. Geological Survey, Professor W. M. Davis pointed out that only 40 per cent of the national domain has been surveyed (see February *Review*, pp. 139-140). Ways and means of expediting the work were discussed, especially the means of securing larger Congressional appropriations, and a petition to that effect was circulated during the meeting for the signatures of the members.

Luncheon on Friday and Saturday was served in the American Geographical Society's building. On Friday the speaker was Major-General Leonard Wood, Commander of the Department of the East, who testified to the military necessity of a topographic map for the whole United States and then spoke on the general subject of preparedness.

Twenty-two members of the Association, including several members from the Middle-West and South, were present at the meeting, as follows: Henryk Arctowski, O. E. Baker, Isaiah Bowman, A. P. Brigham, R. M. Brown, Collier Cobb, S. W. Cushing, W. M. Davis, R. E. Dodge, Leon Dominian, C. R. Dryer, O. L. Fassig, N. M. Fenneman, J. P. Goode, R. M. Harper, W. L. G. Joerg, D. W. Johnson, Lawrence Martin, W. G. Reed, G. B. Roorbach, J. Russell Smith, P. S. Smith. The sessions for the reading of papers, which were open also to other persons interested besides members of the two organizations, were attended by from eighty to one hundred and twenty persons.

THE GEOGRAPHICAL WORK OF DR. E. W. HILGARD

Eugene Woldemar Hilgard, Ph.D., LL.D., who was born in Zweibrücken, Germany, on January 5, 1833, and whose death in Berkeley, California, on January 8, 1916, was noticed in the March *Review*, although not usually classed as a geographer, was one of the most noteworthy pioneers in geographical science in America. He was a splendid example of a type of broad-minded men versed in several sciences, common in the nineteenth century but becoming scarce in these days of increasing specialization. He was best known as a soil investigator, but he was also a chemist, geologist, and agronomist, and he had probably a better working knowledge of botany than any one else who has specialized in soils.

Dr. Hilgard spent most of his boyhood in Illinois, attended college in Switzerland and Germany, and did geological work in Spain. After returning to the United States he spent about two years in Washington, D. C., sixteen in Mississippi (most of that time as state geologist), two in Michigan, and nearly half his life in California. In the intervals of other work he also conducted geographical reconnaissances in Louisiana in 1867 and 1869 and in Montana and Washington in 1881-1883. His last visit to the eastern states was in 1891; and in later years his infirmities did not permit him to wander far from his home.

His first contribution to geography was his 415-page "Report on the Geology and Agriculture of the State of Mississippi," printed in 1860 (but not generally distributed until several years later, on account of the Civil War).[1] In that the state was divided into eight geographical divisions, and the geology, soils, vegetation, and agricultural features of each (except the Yazoo Delta) described in an interesting manner, and so accurately that one can find little fault with it even at this day.

The same principles were further elaborated in the reports on cotton production (modestly so called) of the southeastern states and California, in the fifth and sixth volumes of the Tenth Census, published in 1884.[2] Doctor Hilgard planned and directed the whole work and contributed about sixty pages of introductory matter, three pages on the "General features of the alluvial plain of the Mississippi below the mouth of the Ohio," the reports on Mississippi, Louisiana, and California, and a general agricultural map of the southeastern states which was a remarkable piece of work for that time.[3] The other states were assigned by him to the best geographers of each state (most of them state geologists). Agricultural (or rather geographical) maps of each state were printed in colors, and some of these have not been improved upon by any one else in three subsequent decades. The text, although ostensibly dealing primarily with cotton production, covers in considerable detail, for almost every region, such matters as geology, soils, topography, climate, vegetation, crops, proportion of improved land, density of population, ratio of white and negro population, yield of cotton per acre, transportation facilities, etc., with many interesting correlations to delight the geographer.

These cotton production reports, although fairly well known to geologists (probably because five of the six authors were or had been prominently connected with state geological surveys), have apparently been overlooked by most geographers, for several reasons. In the first place, there were few real geographers in this country at the time they were published, and very few have ever lived in the southeastern states at any subsequent time. Then, one does not ordinarily look in census reports for scientific contributions, and the volumes of the Tenth Census were very cheaply and unattractively bound and the gilt lettering on their backs became almost illegible in a comparatively short time, so that one would easily pass them in a library without noticing them. Finally, the large quarto size of these volumes made them too inconvenient for reference purposes, an opinion expressed more than once by Doctor Hilgard himself.[4]

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[1] See *Amer. Journ. Sci.*, Vol. 82, 1861, pp. 151 and 303; *Tenth Census of the United States*, Vol. 5, 1884, pp. 67 and 201; *Amer. Geologist*, Vol. 27, 1901, pp. 304-305; and *U. S. Geol. Surv. Bull. 283*, pp. 5-6, 1906.

[2] The one on Louisiana was first issued as a special census bulletin in 1881, as a model for the rest. See *Amer. Journ. Sci.*, Vol. 122, 1881, pp. 245-246.

[3] See *Bull. Torrey Botanical Club*, Vol. 37, 1910, p. 418.

Hilgard's text-book on soils[5] embodies the results of the researches of a long and active life and contains much interesting geographical matter.[5] A list of some of his shorter geographical papers is given below.

Like most of his broad-minded contemporaries, Doctor Hilgard always wrote in plain, simple language, as free as possible from technicalities (other than names of geological formations, fossils, chemical compounds, etc.),[6] and with faultless grammar. As befits a truly great scientist, he was extremely modest, sincere, and unaffected.

Appreciative notices of Doctor Hilgard's work were published during his lifetime in the Report of the U. S. National Museum for 1904,[7] the *U. S. Experiment Station Record*,[8] and the *Bulletin of the Geological Society of America*.[9] There is a brief sketch of his life in the first number of *Soil Science* (New Brunswick, N. J., 1916), and two longer articles about him in *Science* for March 31, 1916. A more complete biography, with bibliography, will doubtless be published in the near future by some of his geological colleagues. His publications extend over a period of more than sixty years and comprise more than two hundred titles. Besides the books already mentioned, the following pamphlets and serial articles are of interest to geographers, though the titles do not indicate the fact very plainly in every case. The arrangement is chronological.

On the Quaternary Formations of the State of Mississippi. *Amer. Journ. Sci.*, Vol. 91, 1866, pp. 311-325.

On the Geological History of the Gulf of Mexico. *Amer. Journ. Sci.*, Vol. 102, 1871, pp. 391-404.

Supplementary and Final Report of a Geological Reconnoissance of the State of Louisiana, Made under the Auspices of the New Orleans Academy of Sciences and of the Bureau of Immigration of the State of Louisiana, in May and June, 1869. Pamphlet, 44 pp. New Orleans, 1873.

The Later Tertiary of the Gulf of Mexico. *Amer. Journ. Sci.*, Vol. 122, 1881, pp. 58-65, with map.

(With T. C. Jones and R. W. Furnas.) Climate and Agricultural Features and the Agricultural Practice and Needs of the Arid Regions of the Pacific Slope, with Notes on Arizona and New Mexico. 182 pp. Unnumbered report [subsequently designated No. 20], U. S. Department of Agriculture, Washington, 1882. [Not seen; abstract in *Amer. Journ. Sci.*, Vol. 125, 1883, p. 240.]

Soils of the Yakima and Colville Regions [Washington]. *Northern Transcontinental Survey, Agric. Dept., Map Bull. No. 1.* 1 p. of text, 3 maps (folio). New York, 1883.

Agriculture and Late Quaternary Geology [in the upper San Joaquin valley, California]. *Science*, Vol. 11, 1888, May 18, pp. 241-242.

The Lakes of the San Joaquin Valley. 4 pp. *California Exper. Sta. Bull. 82.* 1889.

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[4] See E. A. Smith, *Bull. Geol. Soc. Amer.*, Vol. 25, 1914, pp. 176-177.

[5] Soils: Their Formation, Properties, Composition, and Relation to Climate and Plant Growth in the Humid and Arid Regions. xxvii and 593 pp. The Macmillan Co., New York, 1907. See reviews in *Science*, Nov. 30, 1906, and *Torreya*, August, 1907.

[6] See his remarks on this point on pages vii and 207 of his "Report on the Geology and Agriculture of Mississippi," 1860.

[7] pp. 441, 483, 484, 561, 535, 700.

[8] Vol. 21, July, 1909. pp. 1-4.

[9] Vol. 25, 1914, pp. 170-173 and 176-177.

A Report on the Relations of Soil to Climate. 59 pp. *U. S. Weather Bureau Bull* 1892. Reviewed in *Exper. Sta. Rec.*, Vol. 4, 1892, Oct., pp. 276-282. Partly reprinted with revisions, in *California Exper. Sta. Rept. for 1893-4*, pp. 100-139.

The Cienagas of Southern California. *Bull. Geol. Soc. Amer.*, Vol. 3, 1892, pp. 124 127; also in *California Exper. Sta. Rept. for 1893-4*, pp. 185-188.

Steppes, Deserts, and Alkali Lands. *Pop. Sci. Monthly*, Vol. 48, 1896, March, pp 602-616, with a few diagrams and figures.

Origin, Value and Reclamation of Alkali Lands. *U. S. Dept. Agric. Yearbook fo* *1895*, pp. 103-122, Figs. 3-7, Pl. 2. 1896.

Nature, Value and Utilization of Alkali Lands. 46 pp., 15 figs. *California Exper* *Sta. Bull. 128.* 1900.

Why Ancient Civilizations Flourished in Arid Regions. *North American Rev.*, Vol 175, 1902, pp. 309-315.

The Prairie Mounds of Louisiana. *Science*, N. S., Vol. 21, 1905, Apr. 7, pp 551-552.

The Exceptional Nature and Genesis of the Mississippi Delta. *Science*, N. S., Vol 24, 1906, Dec. 28, pp. 861-866.

A New Development in the Mississippi Delta. *Pop. Sci. Monthly*, Vol. 80, 1912 March, pp. 236-245.

ROLAND M. HARPER.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

New Fellows of the Society; Meetings of March and April. A regular monthly meeting of the Society was held at the Engineering Societies' Building, No. 29 West Thirty-ninth Street, on Tuesday evening, March 21. President Greenough presented by name the following persons, recommended by the Council for election as Fellows, and after a vote they were declared elected:

Donald S. Birkett
Albert H. Chamberlain
Leslie E. Coffin

Mr. B. R. Baumgardt, a member of the Southern California Academy of Sciences, then addressed the Society on "Sweden."

An extra inter-monthly meeting was held on March 14 at which Leo Wiener, Professor of Slavic Languages and Literatures at Harvard University, spoke on "Russia."

At a regular monthly meeting of the Society held on Tuesday evening, April 25, the following persons were duly elected Fellows of the Society:

Henry M. Ami
Mrs. Ralph Boyce
Frank G. Carpenter
Percy D. Dwight
Raymond B. Earle
Frank Roy Fraprie
John W. Frothingham
George M. Garland
Roy Garland
Lindley M. Garrison
Philip W. Henry
William Sargent Ladd
Lionel Sutro

Mrs. Harriet Chalmers Adams then addressed the Society on "The Philippines and the Sulu Sea."

At an extra inter-monthly meeting on April 11 Prof. J. Paul Goode, of the department of geography of the University of Chicago, spoke on "The Geographic and Economic Influences in the Great War." Professor Goode explained the geographic causes underlying the present war and, in the form of lantern slides, illustrated his address by means of a large number of ethnographic and other maps and graphs summarizing economic statistics.

NORTH AMERICA

The Oasis of Tuba, Arizona. South and east of the Colorado stretches the Painted Desert, wind-swept, desolate, beautiful in its fantasies of bare rock, color, and wind-carved form. In its vast expanse is only one spot where a reliable supply of drinking water may be found and where a corn crop is assured. This spot is the Tuba oasis ("The Oasis of Tuba, Arizona," by H. E. Gregory, *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 107-119). For centuries Tuba has been a meeting point of routes, a goal and wayside station for many peoples. Its first known inhabitants were the Kisani, ancestors of the modern Hopi, who probably occupied it as an outpost from the Tusayan pueblos. Following the usual custom of the desert these agriculturists were driven out by the nomad hunting tribes from the north, Piute and Navajo. In the mid-seventeenth century the first Spanish explorers arrived. They found the oasis in a state of intermittent cultivation by Hopi farmers creeping cautiously from the nearest pueblo, Oraibi. Long afterwards pioneer bands of Mormons passed through on the route from Salt Lake City. In 1878 they made a permanent settlement, though at the time of foundation the Santa Fé railroad had not been built and all supplies had to be brought over weary trails, 450 miles from Salt Lake City or 370 miles from Albuquerque. Drought and Navajo attacks prevented the little colony from becoming prosperous. Since 1903 Tuba, purchased for the Indian Affairs Office, has become the seat of a government agency and a safe harbor for the old age of the Hopi race. In 1914 over two hundred of the fast-declining tribe have taken up permanent residence at the oasis, and the number is greatly increased during the summer.

In Tuba geographic relationships find one of their simplest expressions. Climate is fate. Its control over vegetation and thus over man is absolute. Hopi civilization was essentially based on Hopi corn (see "The Navajo Country: Part II, The People," by H. E. Gregory, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 652-672). Of the 150 species of plants indigenous to the region, 144 have been put to practical use by this people, and all are known by name. The climate, characterized by its intense local variations, both in temperature and rainfall, is primarily dependent on elevation and exposure. The average precipitation for the period of continuous measurement from 1909 to 1913 is 7 inches, but this is a wet period compared with "the great drought" of 1900 and 1901. Most of the precipitation falls in the winter months. July, following the three driest months, is the crucial month. Corn grown without irrigation can only mature with a July rainfall more generous than the average. But Tuba has means of irrigation. Surface erosion and vertical cutting in the Moenkopi canyon walls have brought springs and water-bearing layers within reach. The water supply of the Moenkopi has actually been notably increased within recent years. The entrenched stream has cut through its alluvial floor to bedrock and augmented its flow by 600 to 800 per cent from 1878 to 1903. On the other hand a minor loss has been sustained through the burial of springs by shifting dunes. On the irrigated school lands of Tuba itself, about 40 acres, and on those of the Moenkopi canyon floor, about 1,000 acres, the Hopis raise surprisingly good crops of corn, wheat, alfalfa, vegetables, and fruit. With the agricultural produce and flocks they are self-supporting and content.

A Remarkable Fall of Hail in Maryland. Exaggerated reports of the sizes of hailstones are frequently met with, and careful investigation of such reports should, whenever possible, be made immediately after the storm and in the locality where the storm occurred. What was clearly an unusual fall of hail occurred in Maryland on June 22, 1915, and has been critically studied by Prof. Oliver L. Fassig, of the U. S. Weather Bureau (*Monthly Weather Rev.*, 1915, pp. 446-448). Fortunately, the largest hailstones fell in and about Annapolis, where many measurements of the stones were made. Ten or twelve stones, accurately measured by two officials of the U. S. Naval Academy, gave an average diameter of 3½ x 3 inches, with a maximum major diameter of 3 15/16 inches. These and other measurements show that the largest hailstones had a circumference ranging from 10 to 12 inches. Obviously, the popular reports of hailstones of "the size of a baseball or an orange" were not greatly exaggerated (a "league baseball" measures 9 inches in circumference). Many of the larger hailstones weighed about as much as a baseball (5 ounces). In some of the larger stones, from twenty to twenty-five concentric layers of opaque and transparent ice were counted. There were only two reports of personal injuries, both of them very slight. Skylights of glass 5/16 inch thick, with embedded wire netting, were broken.

In his "Lehrbuch der Meteorologie," von Hann cites occurrences of hailstones measuring from 4 to 6 inches in diameter and weighing over a pound. In India, Eliot found that 22 per cent of 600 hailstones measured were larger than a lemon. Another investigator, Buist, found the mean maximum circumference of Indian hailstones to be from 4 to 6 inches; the largest were 10 to 13 inches in circumference, and weighed from slightly over half a pound to one pound and a quarter. R. DEC. WARD.

The Subdivision of the United States into Physiographic Provinces. The inception of the important undertaking of providing a standard subdivision of the United States into physiographic provinces which has just been achieved with such marked success is related by F. E. Matthes in the latest issue of the *Annals of the Association of American Geographers* (Vol. 5, 1915, pp. 127-129). The presentation of various related papers at the Princeton (1913) and subsequent meetings of the Association showed that the matter was ripening to expression. Accordingly, at the Chicago meeting (1914) a "round table" conference was held at which Professor Nevin M. Fenneman of the University of Cincinnati, who had presented an important paper on "Physiographic Boundaries within the United States" the year before, presided. The first part of the discussion served to clarify ideas as to the scope of the work contemplated. While the importance of the "natural region" in systematic regional geography was recognized, it was felt that its composite nature—based, as it is, on a combination mainly of the three elements of relief, climate, and vegetation—makes it rather a matter for the individual investigator to determine, according to the purposes of his inquiry. A physiographic province, on the other hand, is a unit of a single kind, susceptible of more or less precise delimitation. The conference accordingly decided that the physiographic province, i. e. an area that throughout its extent has had essentially the same geomorphologic development, was the unit to be used in the subdivision of the United States. After discussing a number of topics such as the size and rank of provinces and their subdivisions, the character of the boundaries and the best mode of representing them on a map, the conference proceeded to a partition of the North American continent into its primary divisions. None of the questions at issue was definitely settled, nor was it the object of the conference to undertake to settle them; but the nature and spirit of the discussions and the general feeling of harmony that prevailed guaranteed the success of the plan. The conference accordingly ended by passing a resolution recommending to the Council of the Association the appointment of a committee to undertake the preparation of a map of the physiographic provinces of the United States.

The committee appointed consisted of the following members: Nevin M. Fenneman, chairman; Eliot Blackwelder; Marius R. Campbell; Douglas W. Johnson; and François E. Matthes. At the Washington meeting of the Association in December, 1915, it was reported (see February *Review*, p. 136) that final agreement as to a working basis had been reached and that several provinces had been outlined. Quickly following upon this announcement came the display, at the recent joint meeting of our Society and the Association, on April 14 and 15, of the completed map. Two maps, strictly speaking, were exhibited, one showing the eight major physiographic divisions of the country and their constituent twenty-two provinces, and the other, the twenty-two provinces and their eighty subdivisions, called sections. The number of the latter is an indication of the magnitude of the task which the committee faced, and that it should have solved the problem so successfully reflects great credit upon its members and its indefatigable chairman, Professor Fenneman, whose previous extensive researches greatly facilitated the prompt completion of the undertaking. The map, which will at once be accepted as the standard representation of its kind, will shortly be published and made generally accessible, possibly through the U. S. Geological Survey.

Resumption of Traffic in the Panama Canal. The Panama Canal was reopened to traffic on April 15 with the passage of sixteen ships, seven bound for the Atlantic, and nine, including an army transport, for the Pacific. The waterway was blocked by slides in September (see January *Review*, p. 53) and has virtually been closed to traffic since. During this time the dredging fleet has removed a vast quantity of débris from the Gaillard Cut (formerly called the Culebra Cut) and has made the channel through the cut better than it ever was. It now has a width of 300 feet for a distance of a quarter of a mile and a maximum depth of approximately 35 feet.

Expert opinion as to the recurrence of slides and their prevention has just become available in the preliminary report of the committee appointed by the National Academy of Sciences at the request of President Wilson, a summary of which was published in the daily press of March 17. The preliminary report was prepared by Charles R. Van Hise, President of the University of Wisconsin, chairman; General H. L. Abbott, Corps of Engineers, U. S. Army; John C. Branner, professor of geology, Stanford University; Whitman Cross, geologist, U. S. Geological Survey; R. C. Carpenter, professor of mechanical engineering, Cornell University; Arthur P. Davis, chief of the Reclamation Service, Washington; John R. Freeman, consulting engineer, Providence; J. F. Hayford, dean of the College of Engineering, Northwestern University; and Harry Fielding Reid, professor of dynamic geology and geography, Johns Hopkins University.

"The committee looks to the future of the canal with confidence," the report declares. "It is not unmindful of the labor necessary to deal with the present slides, and it realizes that slides may be a considerable, but not an unreasonably large, maintenance charge upon the canal for a number of years: it also realizes that trouble in the Culebra district may possibly again close the canal. Nevertheless, the committee firmly believes that, after the present difficulties have been overcome, navigation through the canal is not likely again to be seriously interrupted. There is absolutely no justification for the statement that traffic will be repeatedly interrupted during long periods for years to come. The canal will serve the great purpose for which it was constructed, and the realization of that purpose in the near future is assured.

"The committee believes that some sliding ground will continue to enter the canal for several years to come, though in diminishing amounts. Any relatively inexpensive measures which tend to arrest the present active slides or which promise to reduce the charge against maintenance of the canal in the future are therefore fully warranted."

The committee believes that every available and practicable device should be used to divert precipitation from the area susceptible to slides. It suggests the following measures: (1) covering slopes with vegetation; (2) filling up the peripheral cracks that appear as warning signs, so that they will not intercept surface water; (3) drainage, both surface and tile, of undisturbed and threatened areas near the slides to prevent them from becoming unstable; (4) drainage of the slides themselves by a complete system of open drains which could carry the water away as directly as possible; (5) drainage by means of tunnels in a few special cases; (6) making a cut by sluicing in the East Culebra slide, starting at an appropriate point on the canal and diverging from it diagonally in a general southeasterly direction, in the zone of gentle slopes and in such a position as to reach the large pond which now exists on the slide.

A Military Map of Northern Mexico. A timely map of northern Mexico has just been received by the Society from the Pan American Union, Washington, D. C. It is entitled "Map of Sonora, Chihuahua, and Coahuila, Mexico" and is on a scale of 1:100,000, or about 16 miles to the inch. It was prepared by the War College Division of the General Staff in December, 1913, and was reproduced for the Pan American Union in 1914. It comprises all of Mexico—except the Gulf coastal plain—north of 26° N., i. e. the latitude of the city of Durango, together with southern Arizona and New Mexico and western Texas. The map is on the same scale as the official topographic map of Mexico published by the Comisión Geográfico-Exploradora, of which, however, only a small number of sheets have been published for this region (see the index map in the *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, opp. p. 434), so that the War College Division map constitutes the most detailed existing representation of the area. Lines of communication are very fully shown, as is natural in a military map. The great number of roads seems at first surprising for a region reputed so pathless as the Chihuahua desert, but it should be remembered that many of those represented—even the best of the three grades indicated—are but mere tracks. Indeed, closer examination shows that the road mesh in Chihuahua and Sonora averages forty or fifty miles across, as against about twenty in Sonora and five to ten miles in western Texas. The map is well suited to following the movements of the punitive expedition against Villa, all the places that have so far figured in the press despatches, Columbus, Hachita, Colonia Dublan, Casas Grandes, Babicora, Namiquipa, Guerrero, and Parral being indicated, together with much detail concerning mining centers, mountains, and railroads.

Studies of Central American Lakes. Four lakes situated on the Pacific slope of Central America, Amatitlan and Atitlan in Guatemala and Ilopango and Coatepeque in Salvador, were visited in February, 1910, by Chancy Juday. The account of his limnological observations is published in the *Transactions of the Wisconsin Academy of Sciences, Arts, and Letters* (Vol. 18, Part I, Oct., 1915, pp. 214-250). All lie near the middle of the north-tropical zone in a region which has a dry winter season from November to April and a wet season for the remainder of the year. They belong to the tropical class whose waters are disturbed throughout their entire depth but once a year. The purpose of the investigations was to obtain data on dissolved gases and net plankton content. Considerable interest was added to these researches by the situation of the lakes in volcanic regions.

It was found that no permanent stratification existed which would produce bottom stagnation of the water. The process of overturning and circulation takes place between the middle of November and the middle of December. As cool weather sets in the temperature of the upper layer of the water falls and convection currents are formed. The wind also produces circulation disturbances. This mixing of the water in winter produces a fairly uniform distribution of the dissolved gases and other substances held in solution. Water from the lower layers attains the surface and renews its supply of oxygen.

The plankton collected shows abundance and compares favorably in quantity with that of lakes in temperate latitudes. The greatest variety of forms was found in Lake Amatitlan, the shallowest of the four.

SOUTH AMERICA

Floods in the Argentine Territories. The progress of southern Argentina may be said to be punctuated by the meteorological extremes, flood and drought, to which the semi-arid region is subjected. Indians living on the banks of the Rio Negro described extraordinary floods in the years 1845-47. In 1879 a section of General Roca's expeditionary force against the Pampas Indians was imperiled by flood near the fort that bears his name, and lower down the valley early settlers suffered much loss. A single *hacendado* is said to have lost 20,000 sheep. Twenty years later Trelew in the Chubut was swept away, and the Welsh colonists deprived of practically all they had gained by previous good harvests. Since the last date the Argentine government has been engaged upon measures for the control of flood waters. In 1910 work was commenced on the Neuquen barrage, the great project that is to accomplish not only the aforesaid purpose but by irrigation is also to open up to settlement the Rio Negro valley, one of the most fertile areas of the republic. However, in a recent issue of the *South American Journal* (Dec. 18, 1915) it is stated that the flood-resisting strength of the nearly completed dam has been called in question; a question not improbably suggested by a recent catastrophe in the Colorado valley, north of and hydrographically similar to the Rio Negro. The unprecedentedly heavy rains of a year ago broke down the natural dam that in a late geologic period had formed the Andean lake of Carrilauquen, a source of the Colorado. The released waters, amounting to 2,800,000,000 tons, precipitated themselves into the lower valley and 350 miles away flooded the Neuquen railroad line to such a degree that traffic was suspended for more than a month and heavy expenses incurred on account of damage to stock and property. The incident is briefly described in the *South American Journal* of October 16, 1915, and the *Geological Magazine* of December, 1915.

The Production of Cinchona: A Lost Industry of South America. The history of South America's commerce in the ''divine medicine'' shows even more than the usual exigencies of tropical production. Introduced to Europe by the Countess of Chinchon in 1640, the bark owed its first exploitation to those indefatigable pioneers of South American industry, the Jesuits. Early production was confined to the forests of Loxa whence exportation proceeded through the port of Payta. Reckless destruction of the trees of the Ecuadorian *montaña*—Humboldt reported that 25,000 were destroyed in a single year—led to search elsewhere in the Spanish domain (Quinine: A South American Gift to Humanity, by Edward Albes, *Bull. Pan Amer. Union,* Jan., 1916). Recovery from the period of depression incident on the Wars of Independence led to a remarkable development in the Peruvian montaña. In the mid-nineteenth century cinchona held the prominent place now occupied by rubber. Tribes of the lower *montaña,* from whom the *cascarilleros* were recruited, as are the *caucheros* of today, are said to date their chronology from the days of the ''Great Quina.'' The government establishment of cinchona as a monopoly, with attempt to rule the prices on the European market, led to crises, failures, and endless legislation but stimulated production. High prices immediately caused a search for new forests. Such were found and stripped in the Bolivian *yungas.* In the first year after the creation of the monopoly the bark arriving in La Paz was nearly three times the amount legally available for export—7,000 quintals, an amount likewise exceeded by contraband export from the ports of Arica and Islay (Weddell: Bolivie et Peróu, Paris 1853; Favre-Clavairoz: La Bolivie, *Revue Contemporaine,* Paris, 1857). The introduction of the cinchona species into Java by the Dutch and into India and Ceylon by the British Government through Sir Clements Markham was the death blow to the South American industry. In 1882 Peru and Bolivia still exported as much as 8,900,000 pounds, about half the world's supply, but from that date the decline became rapid, and the present exportation is a negligible feature of their commerce. The wild forest product of a region almost devoid of means of communication and ill supplied with labor could not compete against carefully cultivated and accessible plantations in lands of abundant labor. But the present war is introducing new features into the world trade in quinine. The neutral nations are finding themselves practically cut off from the great markets of the East. Before the outbreak of the war the drug was sold at 20 cents per ounce; at the beginning of the current year the price had risen to $1.50, with prospects of going indefinitely higher. The situation calls attention back to the still undeveloped possibilities of the original home of the product. In recent years only spasmodic efforts have marked the industry in Peru and Bolivia. At Cuzco and La Paz a rather pretentious company was organized in 1911 for the exploitation of *cascarilla* in the Urubamba Valley in the little-known region of the ''Great Bend'' (''The Cañon of the Urubamba,'' by Isaiah Bowman, *Bull. Amer. Geogr. Soc.,* Vol. 44, 1912, pp. 881-897), but the lack of Indian (Machiganga) labor, the enormous difficulties of transportation, and the scarcity of plants brought disaster, and the field party turned to the rubber industry with quite as little success.

AFRICA

The Development of African Railways. Sir Charles Metcalfe, long connected with the work of Cecil Rhodes in South Africa as engineer of railway construction, has written a paper (Railway Development of Africa, Present and Future, *Geogr. Journ.,* Vol. 47, 1916, pp. 3-21, with map, 1:20,000,000) presenting many facts as to the origin and development of railway enterprises in Africa, beginning with 1857, when the first line, 54 miles long, was built between Cape Town and Wellington. Commercial, political, and military considerations have been the main factors in railway building. No routes were extended far into the interior of South Africa till diamonds were discovered at Kimberley and gold in the Witwatersrand district, where Johannesburg now stands. Cape Town and the rival seaports of Port Elizabeth, East London, and Durban competed for the Johannesburg trade, and all built lines that put them in touch with this gold mining center. Then President Kruger, of the Transvaal Republic, was influential in securing a rail route between the Portuguese port of Lourenço Marques on Delagoa Bay and Johannesburg; and Cape Colony supplied some of the money for it.

The track gage of three feet and six inches, still used in the Union of South Africa, is, in the opinion of Sir Charles, a great handicap to trade and development, for the distances are great and the narrow-gage speed is only half that on the standard-gage roads of Europe.

Among the many railway achievements which Sir Charles briefly describes are the lines from Daressalam, the capital of German East Africa, to Lake Tanganyika, 778 miles long, completed in February, 1914, at a cost of $35,000,000; the Shire River Railway, extended in 1914 from Blantyre in the British Nyasaland Protectorate to Chinde, the ocean port of the Zambezi River; the British East Africa Railway from Mombasa on the Indian Ocean to Victoria Nyanza, 582 miles; the branch extended from this line to Lake Magadi solely to tap its enormous soda resources; the great military line built by Kitchener in 1897 from Wadi Halfa through the desert across the bend of the Nile to Abu Hamed, extended to the Atbara in 1898, to Khartum in 1899, and later to Sennar on the Blue Nile and across the White Nile to El Obeid in Kordofan; and the line from the Atbara to Port Sudan, giving the Egyptian Sudan an all-rail outlet to the Red Sea. Turning to the Atlas region, Tunis has 1,144 and Algeria 2,298 miles of railway, chiefly coast lines with branches to or toward the desert; and when the war began, railways were making remarkable progress in Morocco towards Fez and Marrakesh.

Sir Charles says that, as a rule, it has been difficult to raise funds for railroad enterprises. River steamers have therefore been used as far as possible, railways working in conjunction with them. As trade increases, the railways will be made continuous, the rivers still being used as feeders. The railways that are being pushed steadily forward from the coast into the center of Africa will some day inevitably connect with the great trunk line passing north and south through the continent.

Cecil Rhodes, he says, never despised any great region, however uninviting it might appear, and his eyes were always fixed on the great territories north of Cape Colony. The railroad he conceived has now been built north as far as Bukama in the Katanga province of the Belgian Congo, 2,500 miles from Cape Town. A large part of it will form the southern section of the Cape-to-Cairo line (see note in the March *Review*, pp. 220-221), though Sir Charles does not use this name. In connection with this great enterprise, he speaks of the remarkable provision in the will of the late Alfred Beit, who bequeathed $10,000,000 in trust for financing railways in Rhodesia. He desired the money to be expended in the building of railways that are necessary but cannot possibly pay for some years. Capital will come to their support as soon as they are on a paying basis, and the bequest will then be used again for other railways. It is hoped that the money will be used in building a railway from the station of Broken Hill in Rhodesia to Tabora in German East Africa, then north to Sennar on the Blue Nile. There the last rail on the Cape-to-Cairo route will be laid. CYRUS C. ADAMS.

The Trade of Lourenço Marques in 1914. The trade of Lourenço Marques depends almost entirely upon the Transvaal, its natural commercial hinterland (*Diplomatic and Consular Repts.*, Ann. Series, No. 5558, London, 1916). Its activity comprehends three main phases—transit trade, in competition with Natal and the Cape; coaling trade; and trade as a recruiting center for the native labor employed on the Rand. Expenses and fees of the recruiting agency and gold brought into the country by the returned labor have contributed greatly to local prosperity. In 1913 the South African government decreed that no more labor should be imported from north of 22° S. latitude. As most of the Portuguese native labor comes from the province of Mozambique the blow has been severely felt. Endeavors are being made to substitute São Thomé as a field for contract labor under similar terms to those engaged in with the Transvaal. During the year 5,644 natives were dispatched to this destination. Other causes have contributed to produce the serious depression of the year—industrial disturbances in the Rand, prolonged drought, and, as a final crisis, the European war.

AUSTRALASIA AND OCEANIA

Weather Forecasts from Cirrus Cloud Directions in Australia. A somewhat unique publication comes from the highly progressive and efficient Australian Bureau of Meteorology. It is a study by E. T. Quayle of the relations between cirrus directions as observed in Melbourne and the approach of the various storm systems affecting Victoria (*Bulletin No. 10*, 1915). The object of the investigation is to increase the accuracy of the official forecasts and also to enable persons in the country "to gage with some degree of probability the amount of rain likely to result during the passage of depressions of the various types." While general relations between cirrus movements and storms have, of course, been investigated by numerous meteorologists (in the United States, by the Blue Hill Observatory staff, under the direction of the late Prof. A. Lawrence Rotch; and by Prof. F. H. Bigelow, formerly of the U. S. Weather Bureau), we have no publication of practical use for the everyday non-professional observer which is nearly as complete as the present volume. Mr. Quayle points out that the relations between cirrus directions and storm systems is twofold: (1) cyclonic systems of air circulation usually extend their influence to the cirrus level; (2) the general drift of the air at that level has an influence in determining the development and translation of cyclonic or other storm systems. The relation of cirrus movements and the various storm types is considered in detail. A considerable series of simplified weather maps shows the cirrus directions at Melbourne and the rainfall distribution in connection with all the different types of storms.

Light is thrown on the genesis of many Australian cyclonic disturbances. These are often preceded by an extensive flow of air, at cirrus level, from the tropical belt. At first this air movement is non-cyclonic and on a very extensive scale. A wide stream of air begins to move polewards, bodily, accompanied by increasing cloudiness, which leads to thunderstorms and widespread rains. This phenomenon may continue without cyclonic development until latitudes 30°-35° S. are reached. Then the increasing differential effect of the earth's rotation becomes manifest in the formation of a cyclonic circulation around a central low. The dynamic energy of the whirl often results in the early formation of a high-pressure ridge across the barometric valley previously connecting it with the tropical low-pressure belt. From this time on, the rainfall is controlled by the cyclonic circulation. The cyclone then proceeds on its way eastward as an extra-tropical cyclone and finally merges in the great Antarctic low-pressure belt. The original latitudinal atmospheric movement results from the attempt to restore equilibrium, temporarily lost, between portions of the polar and equatorial belts. R. DEC. WARD.

A Proposed Expansion of the Pastoral Industry of South Australia. In 1914 the Geological Survey of South Australia organized an expedition to investigate the mining and pastoral prospects of the little-known region of the Musgrave and Everard Ranges (The Geology and Prospects of the Region to the South of the Musgrave Ranges, and the Geology of the Western Portion of the Great Australian Artesian Basin, *Geol. Survey of South Australia Bull. No. 5*, Adelaide, 1915). These ranges are residuals rising above peneplaned surfaces of ancient rock west of the "great artesian basin." Mineral prospecting is not easy, for much of the widespread level surfaces is cloaked with deep superficial deposits. Thus, while the mineral possibilities cannot be said to have been exhaustively examined, in so far as the reconnaissance went prospects are not encouraging. No trace of tin was encountered, and the evidences of gold and copper were scant in a region where, on account of transportation difficulties and restricted water supply, a deposit must be rich to have any economic worth.

Prospects for the pastoral industry are brighter. The vegetation is generally sufficient. The staple for stock is found in the good grasses of the valleys. Other areas offer supplementary resources that would prove invaluable during dry seasons. There are the coarse grasses of the sandy tracts, the rushes of the swampy depressions, the salt bush of the elevated stony plains, the hill porcupine grass, inedible in the main but affording a delicacy in its inflorescence. The industry is assured if sufficient water can be obtained. This factor depends entirely upon local meteorological conditions, for west of the Cretaceous artesian basin there is no assurance of underground water. Water is obtained from waterholes and shallow wells, the supply of which is known to vary greatly. Giles in the first exploration of 1873 reported Ferdinand Creek as a "perennial running stream." In 1895 its water was much reduced but still was sufficient to support 1,000 head of cattle. The 1914 expedition found no moisture even at the bottom of the sand of the stream bed. Other circumstances indicate the present as a period of exceptional drought. The Musgrave Range has been deserted by the natives, and everywhere the vegetation shows signs of exhaustion. On the other hand there exist evidences of recent floods and comparatively heavy rainfall. In one native camp a child of seven or eight years of age was pointed out as born in the year of a big and general flood. The region lies in the transitional zone between the belt of cyclonic storms and the monsoonal rains of the north. There is no rainfall record, but on the transcontinental telegraph line to the east the annual average (*Commonwealth Bur. of Meteorol. Annual Summary, 1910*) is about 5 inches. The summer monsoonal rain is the more important, and local residents say that 3 inches in the early summer is sufficient to maintain the industry satisfactorily for a year. In the two localities possessing wells sheep and cattle are thriving. Expansion of the industry must be preceded by the sinking of wells—as many as possible to conserve the neighboring pasture—in the restricted areas where the right surface conformation and rock structure for water catchment exist. Heretofore there has been no stimulus to expansion, but today the worldwide reduction in stock accentuated by the European war, the elimination of former competitors, and the improved facilities for shipment offer new incentive to the pastoral industry.

POLAR REGIONS

Return of the "Aurora" of the Shackleton Expedition. Press despatches report the arrival on April 3, at Dunedin, New Zealand, of the *Aurora*, the ship which was to establish a base on the shore of Ross Sea for the members of Sir Ernest Shackleton's expedition on their arrival from Weddell Sea on the opposite side of the Antarctic Continent. The *Aurora* left Hobart, Tasmania, at the end of 1914. On January 9, 1915, she arrived at Cape Crozier, the eastern tip of Ross Island. Finding conditions too bad to permit landing, the *Aurora* sailed west around the island to Cape Evans, off which she anchored. From the end of January to the middle of March various expeditions ashore were made for the purpose of landing stores, arranging the depot, testing the motors, and doing scientific work. On May 6 during a violent blizzard the *Aurora* broke away from her moorings. There were then ten men ashore, including Lieutenant Mackintosh, the leader of the Ross Sea party, H. E. Wild, Ernest Joyce, J. Cope, A. Stevens, A. Spencer Smith, and Victor Hayward. The ship, with the remainder of the crew, then became blocked in pack ice and for over ten months drifted helplessly, covering about 500 miles in a general northerly direction along the coast of Victoria Land. On July 21, 1915, the ice pressure severely strained the hull and carried the rudder away. The vessel was then about 90 miles south of Coulman Island, which lies off the coast of Victoria Land in 73½° S. and 170° E., and only got away from the ice on March 14 last, in 64° 30′ S. and 161° E., just north of the Balleny Islands. As soon as she was released, a steering gear was improvised and the course set for New Zealand, which was reached in three weeks, as stated above.

The forced departure of the *Aurora* leaves two parties in possible peril, the main transcontinental party under Shackleton and the shore party under Mackintosh. No news has been received from Sir Ernest since January, 1915, when he started south from South Georgia in the *Endurance* (*Bull. Amer. Geogr. Soc.*, Feb., 1915, p. 129). The ice then was so bad that he did not expect to cross the continent until the next Antarctic summer, beginning in October, 1915. If he succeeded, he will now be hoping to find supplies on descending from Beardmore Glacier, which Mackintosh's party will, however, hardly have been able to reach in their present isolation. If Shackleton is able to reach Cape Evans he will find there an abundance of food and fuel, but no clothing. This and the provisions landed from the *Aurora* also promise to maintain the Mackintosh party if they hold out through the approaching Antarctic winter until succor can reach them, in December, at the earliest.

PHYSICAL GEOGRAPHY

The Natural Region. In a paper entitled ''Natural Economic Regions'' (read at the Chicago meeting of the Association of American Geographers, 1914, and printed in the *Annals* of the association, Vol. 5, 1915, pp. 121-125), Prof. Charles R. Dryer calls attention to the prime need of the geographer of today—the establishment of the ''natural region.'' Man's changing and varied relations to his environment render the problem complicated in the extreme. The best method of approach appears to be by the economic interpretation. Economic influence affords a basis for the estimation of the relative values of the different factors entering into the complex. The natural economic complex is based fundamentally upon vegetation, functioning in part through animal media, and upon climate, itself the primary phytogeographic control. In the determination of the major natural regions physiographic controls are of subordinate importance. They operate indirectly through their effect on the two principal factors and are to be considered rather as important, often dominant, determinants in the subdivision of the major region.

The Distribution and Origin of the Beech. From Bukowina to Buckinghamshire are conserved place-name records of the important part the beech has played in the progress of Western civilization. Its employment by man dates back to Neolithic times in the Swiss lake dwellings. In medieval days it nourished alike hearth and forge and the herds of swine that contributed so largely to man's subsistence. Today the tough, strong wood of the beech finds many uses in the making of wooden ware. For such purposes the North American species is in demand as well as the European. The beech ranges from eastern North America through Europe and the Nearer East; two species occur in eastern Asia, and the range of the family is further extended by the presence in the southern continent of *Nothofagus*, the Antarctic beech, a genus very closely related to the northern beech (*Fagus*). From Chiloe to Tierra del Fuego the rainy Pacific slopes are clothed with dense forest in which the Antarctic beech predominates. In this region of equable but low annual temperature the beech species is characteristically small-leaved and evergreen in habit. These forests are practically unexploited. Unfortunately where the timber might be of greatest service—in the district of Punta Arenas—it is smallest and otherwise unsuitable for the purposes of lumbering. Utilization of the forest must await further settlement. Similar forests exist in New Zealand, and *Nothofagus* is also known in southeastern Australia.

This wide distribution arouses interest in the question of the origin of the beeech (Notes on the Ancestry of the Beech, by Edward W. Berry, *The Plant World*, Vol. 19, 1916, No. 3). The earliest recorded forms appear practically simultaneously in Europe and North America, the one in the Cenomanian of Saxony and the other in the Dakota Sandstone of the western United States, whence is argued their common origin in some third region, presumably Asiatic or Arctic. Present evidence favors the former. The beech has not been found in the Cretaceous of Greenland, though it appears in the Tertiary, and it apparently did not take part in the Cretaceous migratory wave that passed along the eastern coast of North America. Assuming an Asiatic origin, waves would spread westward to Europe and eastward through Alaska and southward to the southern continent, where it is known in the early Tertiary, through Antarctica—it occurs in Graham Land—to New Zealand and perhaps Australia, though Australia may have got its forms via southeastern Asia. The northern origin of the Antarctic form is strengthened by the discovery of *Nothofagus* in European Tertiary deposits, in the Oligocene of Greece.

HUMAN GEOGRAPHY

The Fate of Primitive Races. With few exceptions the contact of races differing widely in civilization has resulted in the decline of the inferior. Much of the explanation lies in the operation of "the law of struggle and work." Too often the higher civilization, simply destructive, has eliminated native habits of work without providing substitute forms. In primitive societies division of labor usually allots cultivation and the handicrafts to the women: men's work is war. The advent of the trader, missionary, settler, and the government intervening for their protection means that war must cease. The men are left with idle hands. In the eastern islands of Malaysia, for instance, although the shock of actual contact with the white intruder has been little experienced, the work-destroying cause has operated from a distance. The tribes are diminishing. The sago-palm offers too easy a livelihood for peoples deprived of their old-time exercise of war. There are, however, some notable examples of the success attending the introduction of suitable work. Not long ago it was predicted that the Maori would soon be extinct as his brother Tasman, but the development amongst the race of farming and sheep-shearing during the last twenty years has reversed the current of decline. All-saving labor has likewise arrested the sterility that threatened to obliterate the natives of the southern New Hebrides (Aboriginal Decay in the Pacific Ocean, by J. Macmillan Brown, *Journ. of Race Development*, Vol. 6, 1916, No. 3). In the southwest of the United States the unspoiled Navajo flourishes, a remarkable exception to the common fate of the North American Indian (see "The Navajo Country," Pt. II, by H. E. Gregory, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, No. 9, and "Record" item, "The Navajo Indian in Relation to the State" in the same number; also "The Era of Indian Demoralization," by Archer B. Hulbert, *Journ. of Race Development*, Vol. 6, 1916, No. 3). Stefansson has shown the destructive influences at work amongst the demoralized Eskimo, and analogous illustrations come from the southern extreme of the continent. In less than half a century the Yahgan Indians of the Ushuaia missions were reduced from several hundreds to a bare handful. The Pampas Indian has gone, and the Patagonian is following him. With their decay one may contrast the historic achievement of the Jesuit Fathers in the Paraguay missions, where, as a motto, work held equal place with obedience.

EDUCATIONAL GEOGRAPHY

Report on School Map Material. At the meeting of the British Association in Manchester last September the Committee on Atlas, Textual, and Wall Maps for School and University Use made a report which is printed in the *Scottish Geographical Magazine* for November (pp. 574-577). The substance of the report follows:

Where both orographical and political maps of one region are provided only names of physical features should appear on the orographical map. The color scheme adopted for the International Map in 1:1,000,000 should be followed as closely as possible for all physical maps. For the sea deepening shades of blue should be used, with depths in feet; for lakes the same blue as for the shallowest sea; also blue for rivers and river names, and red lines for political frontiers on an orographical map. Colors indicating relief should not be interrupted at the frontier but carried to the margin of the map.

Few varieties of projection should be used in a school atlas. For hemispheres, Clark's minimum error projection is best; the globular projection is to be avoided. For continents and larger countries, the zenithal equal-area projection should be used; for smaller countries, a simple conical development. Mercator's projection should be excluded from the body of a school atlas, though it may effectively be employed as an index sheet. Hemisphere maps should be much more freely employed as they are the most accurate representation, except the globe, of the earth's surface. Where practicable, they should be used to exhibit world distributions of all kinds. The scales employed should be few and as a rule simple multiples one of another. On each map the scale should be plainly stated. In the margin should be indicated other towns in the same latitude and also (on maps of wide extent) the area of a quadrilateral of the network.

The few recognized conventional signs are sufficient, except to indicate any new feature such as a first-class wireless station or the employment of river water for power or irrigation. The limit of navigation may be shown by an anchor. The solid black dot for town sites is better than the fine open circle, as more clearly revealing concentration of urban population. Larger towns require a larger dot or a dot within a circle.

Words or conventional signs indicating the distribution of economic production are deprecated. If economic factors must be shown on a general map, solid color or shading should be used to indicate the concentration of industrial population or the locality of two or three commodities of first importance.

Black-and-white maps in school books (textual maps) should not supersede atlas maps but should be confined to illustrating statements in the text. A textual map must be simple and should not attempt to show large detail. Features tending to mutual obscuration should not be shown on the same map.

The recommendations of the Committee in regard to the style of a school atlas apply almost without modification to all wall maps. The scales, however, should be as few as possible and should be simple multiples of each other. The far larger scale of a wall map is no excuse for the introduction of minute detail or a crowd of names. A wall map is essentially a diagram. The use of wall maps without names or with only a few names or initials is greatly to be encouraged. Color both in atlas and wall maps shows relief better than contours. The wall map is intended to supplement but not to replace the atlas. Most wall maps fail by attempting too much.

GEOGRAPHICAL NEWS

Personal

Dr. Joseph Barrell, professor of structural geology in Yale University, delivered during March a series of lectures on the "Nature and Bearings of Isostasy" before the department of geology of Columbia University.

Sir S. G. Burrard, Surveyor-General of India, at the third Indian Science Congress which met at Lucknow on January 13-15 read a paper on "The Plains of Northern India and Their Relationship to the Himalaya Mountains."

Mr. George K. Cherrie, who accompanied Colonel Roosevelt as an ornithologist on his Brazilian expedition of 1914, gave a lecture at the American Museum of Natural History on March 17 and at Public School No. 19 of the Borough of the Bronx on April 4, entitled "With Colonel Roosevelt on the River of Doubt."

Prof. Frederick E. Clements, of the department of botany of the University of Minnesota, spoke on "The Story of the Forest" before the Forestry Club at the New York State College at Syracuse University on December 16.

Prof. Henry C. Cowles, of the department of botany of the University of Chicago, spoke on "The Vegetation of the United States as Influenced by Glacial Action" before the Forestry Club at the New York State College of Forestry at Syracuse University on March 2.

Dr. J. D. Falconer, lecturer in geography at the University of Glasgow, has been appointed temporary assistant district officer in the northern provinces of Nigeria.

Prof. B. E. Fernow, of the University of Toronto, spoke on "The Birth of a Forest Policy" before the Forestry Club at the New York State College of Forestry at Syracuse University on January 27.

Prof. George I. Finlay, of the department of geology of New York University, spoke on April 17 before the New York Academy of Sciences on "The Geology of North Park, Colorado."

Dr. A. A. Goldenweiser read a paper on March 27 before the New York Academy of Sciences entitled "Notes on the Social Organization of Melanesia."

Prof. A. W. Grabau, of Columbia University, spoke on April 17 before the New York Academy of Sciences on the "Geology of the Island of Gotland in the Baltic Sea."

Prof. Lyman B. Hall, professor of English and American history at Oberlin College, will give a course on the "Physical, Political, Commercial, and Historical Geography of England" at the coming summer session of the college.

Mr. Francis Harper, lately of the Brooklyn Institute Museum, has been appointed to make a detailed study of the fisheries of Oneida County, New York, as a basis for scientific working plans for fish stocking and protection.

Mr. Edmund Heller, naturalist, has joined the zoölogical expedition to southern China conducted by Mr. Roy C. Andrews under the auspices of the American Museum of Natural History (see the April *Review*, p. 308). Mr. Heller will be remembered as a joint author with Colonel Roosevelt of a valuable contribution to the zoögeography of Africa entitled "Life Histories of African Game Animals" which was reviewed in the March, 1915, *Bulletin of the American Geographical Society* (pp. 190-192).

Prof. William H. Hobbs, of the University of Michigan, has been elected President of the Michigan Academy of Sciences for the current term of office.

Prof. George D. Hubbard, of the department of geology of Oberlin College, will give a course on field geology during the coming summer session. The region selected is in southern Vermont near the Deerfield River.

Prof. Douglas W. Johnson, of Columbia University, on April 11 before the teachers of Dayton, Ohio, repeated his lecture on "The Influence of Topography on the European War."

Dr. Willis T. Lee, of the U. S. Geological Survey, gave an illustrated lecture on April 7 at Lehigh University on "Camp Life of a Geologist in the Rocky Mountains."

Prof. Lawrence Martin, of the University of Wisconsin, on April 19 gave the Heilprin Memorial Lecture before the Geographical Society of Philadelphia. His subject was "The Gorge of the Upper Mississippi as a Rival of the Rhine Gorge."

Miss Majorie O'Connell read a paper on April 17 before the New York Academy of Sciences entitled "Notes on the Geology of Oesel in the Gulf of Riga."

Mr. Wilfred H. Osgood, of the American Museum of Natural History, spoke on April 28 before the Geographic Society of Chicago on "The Fur Seals and Other Animals of the Pribilof Islands."

Prof. George B. Roorbach, of the University of Pennsylvania, lectured on April 5 before the Geographical Society of Philadelphia on "Venezuela, Our Nearest South American Neighbor."

General Jules M. de Schokalsky, who, it will be remembered, was a member of the Society's Transcontinental Excursion in 1912, has been elected an honorary member of the Italian Royal Geographical Society.

Prof. Rollin D. Salisbury, of the University of Chicago, lectured on April 14 before the Geographic Society of Chicago on "Porto Rico."

Mr. J. Warren Smith, head of the Columbus (Ohio) station of the U. S. Weather Bureau for eighteen years and professor of meteorology at the Ohio State University, has been promoted to be Chief of the Division of Agricultural Meteorology, with headquarters in Washington.

Mr. David T. Thompson, instructor in geology in Goucher College, will give a course on "Physical and Economic Geography" during the coming summer session at Johns Hopkins University. The course will deal with the general principles of the subject and with their application to the European War and to the United States.

Dr. O. H. Tittman, president of the National Geographic Society and formerly superintendent of the U. S. Coast and Geodetic Survey, has been elected a vice-president of the Washington Academy of Sciences for the year 1916.

Dr. Charles R. Van Hise, President of the University of Wisconsin, lectured on March 17 under the auspices of the Sigma Xi Society at the University of Minnesota on "The Panama Canal, with Especial Reference to the Slides." President Van Hise is chairman of the commission appointed at the request of President Wilson by the National Academy of Arts and Sciences to investigate the slides, and returned some time ago from a trip to Panama (see also, above, the note on the "Resumption of Traffic in the Panama Canal").

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the January number, pp. 57-61

NORTH AMERICA

Alaska

Muir, John. **Travels in Alaska.** viii and 327 pp. Ills., index. Houghton Mifflin Co., Boston, 1915. $2.50. 8½ x 5½.

It is indeed fortunate that a permanent record is available of John Muir's Alaska explorations and studies, for the student has in the past been forced to rely on more or less fugitive articles relating to this important work. When Muir made his first journey into southeastern Alaska in 1879 its glaciers had never been studied, and the grandeur of the fiorded coast line was known to but few. It was his vivid account of the magnificent scenery and his sympathetic description of the mountains and glaciers that gave the first call to the mountaineer and naturalist to explore this new field. John Muir's discovery of Glacier Bay and its great ice fields is generally known; but less attention has been paid to his many other contributions to geographic knowledge, such as his exploration of minor bays and visits to glaciers. Aside from the value and interest of its scenic descriptions, the book is full of references to native customs, plants, and animals, as well as to glacial phenomena. It should be read by every nature lover and should be the companion of every Alaska traveler. Alfred H. Brooks.

Ellsworth, C. E., and R. W. Davenport. **A Water-Power Reconnaissance in South-Central Alaska.** With a section on Southeastern Alaska, by J. C. Hoyt. 173 pp. Maps, diagrs., ills., index. *U. S. Geol. Surv. Water-Supply Paper 372.* Washington, 1915. [The area investigated extends from the Bering River Basin to the eastern part of the Kenai Peninsula. It is favored with abundant small water-power resources and includes also a few sites where 1,000 to possibly 5,000 horsepower might be developed. Sources of possible competition lie in the valuable coal and oil fields of this and adjacent areas. The investigations are to be continued this summer (see note on the plans of the U. S. Geological Survey in the April *Review*, p. 306).]

Graves, H. S. **The Forests of Alaska.** Ills. *Amer. Forestry,* No. 265, Vol. 22, 1916, pp. 24-37. [Abstracted in the March *Review*, pp. 216-217.]

Keen, Dora. **First Exploration of an Alaskan Glacier.** Ills. *Mazama,* Vol. 4, 1915, No. 4, pp. 38-39. Portland, Ore.

Moye, M. **Le tremblement de terre de l'Alaska du 11 septembre 1899.** *Bull. Soc. Languedocienne de Géogr.,* Vol. 38, 1915, No. 3, pp. 194-203. Montpellier.

Canada

Alberta, Saskatchewan, Manitoba

Adams, F. D., and W. J. Dick. **Discovery of Phosphate of Lime in the Rocky Mountains.** 36 pp. Maps, diagrs., ills., index, bibliogr. Commission of Conservation, Ottawa, 1915.

Investigations recently carried out by the Commission of Conservation of Canada show a decreased yield in the older grain fields of the Canadian West. The decrease is in large measure due to depletion of the phosphate content of the soil. Sources of supply for a restoration of this content have been considered. The phosphate deposits of Canada known heretofore were limited to the apatite beds of the eastern provinces, with an output never great and altogether insignificant since 1892. In the world's supply of phosphate the United States holds the foremost position, Tunis follows, and other countries contribute comparatively small amounts. The importance of the United States as a producer of phosphate dates back, a short time only, to the discovery of the rich deposits of the western states—Utah, Idaho, Wyoming, and Montana. Throughout this area the phosphate occurs in a well-defined geologic horizon near the top of the Carboniferous. The Montana beds, located roughly two degrees south of the international boundary, suggest the possibility of the occurrence of similar beds in a similar horizon north of the line. The Conservation Commission decided to investigate. Three sections across the Canadian Rockies were selected for reconnaissance, the North Kootenay and Crowsnest Passes, and the Rocky Mountain Park at Banff. In the two former sections Upper Carboniferous strata were proved absent, but in the Banff Park area phosphate, resembling the Montana product in many respects, was found in the same horizon. The discovery and its significance are detailed in the present report, which, in addition, gives suggestions to prospectors who may wish to follow up the discovery, and a bibliography of literature relative to Western phosphate deposits.

Geological map of Alberta, Saskatchewan, and Manitoba. 1:2,217,600. Geological Survey, Dept. of Mines, [Ottawa], 1913.

Map showing irrigation schemes in Alberta and Saskatchewan. 1:2,217,600. Irrigation Office, Dept. of the Interior, Ottawa, 1913.

Ontario, Quebec

Johnston, W. A. **Rainy River District, Ontario: Surficial Geology and Soils.** xii and 123 pp. Maps, ills., index, bibliogr. *Geol. Surv. of Canada Memoir 82: Geol. Series No. 68.* Ottawa, 1915. [Abstracted in the February *Review*, p. 142.]

—— **Mineral Production in the Province of Quebec during 1915, Preliminary Statement on the.** 7 pp. Dept. of Colonization, Mines, and Fisheries, Quebec, 1916. [The heavy decrease in production of structural materials has not been compensated by the increase of metalliferous ores to a record figure.]

Geology [of] St. Hilaire and Rougemont Mountains, Rouville and St. Hyacinthe Countries, Quebec. 1:126,720. Accompanies, as Map 101A, "St. Hilaire (Beloeil) and Rougemont Mountains" by J. J. O'Neill, *Geol. Surv. of Canada Memoir No. 43.* Ottawa, 1914. [The text which this map illustrates was noticed in the Feb. *Review,* p. 151.]

Rainy Lake, Rainy River District, Ontario. 1:63,360. Map 98A, Geological Survey, Dept. of Mines, [Ottawa], 1914. [Also accompanies the report by W. A. Johnston listed above.]

Geology [of] Southwestern Ontario: Outline Map. 1:500,000. Accompanies, as Map 116A, "The Devonian of Southwestern Ontario" by C. R. Stauffer, *Geol. Surv. of Canada Memoir No. 34.* Ottawa, 1915.

United States

North Atlantic States

—— **New York City, Development and Present Status of City Planning in: Being the Report of the Committee on the City Plan,** December 31, 1914, together with papers presented at a meeting of the Advisory Commission on City Plan, December 17, 1914. 76 pp. Maps, diagrs., ills. Board of Estimate and Apportionment [of the City of New York], New York, 1914. 10½ x 6½.

New York has an admirable institution in this Committee on the City Plan. Five borough presidents give it weight, and practical wisdom is provided by the Advisory Commission of twenty-four citizens. They do not expect to formulate a plan for years. For the present they are gathering solid information on the unknown facts that constitute a great city's daily life. Whatever plan they some day submit will be flexible and responsive to changing conditions. These papers serve to formulate the problems that await the Committee's action. Two items may here be dwelt upon: (1) A mistake that cannot be undone is the arrangement on Manhattan Island of numerous cross streets to carry traffic that engineer Randall expected in 1807 to flow from river to river across the infrequent avenues that run the long way of the island. Perhaps it could not have been made out in 1807, by any amount of study, that the main traffic must flow along the avenues. At any rate the blocks run the wrong way, and heavy streams of people and vehicles move along too infrequent avenues on lines interrupted thrice as often as need be by street openings, all because of a faulty conception of traffic needs. (2) On the other hand the Committee has to meet and overcome an enormous opposition of private interests that have no thought of yielding anything to the common good. Myrtle Avenue was laid out 100 feet wide from the Brooklyn Borough line to Jamaica. But the city delayed purchasing title to the required land. Buildings were put up across the proposed lines, and the property owners then forced the narrowing of the street to 70 feet. All plans for the improvement of an American city have to be carried out in full democracy.

It is to be hoped that the Committee's studies of growth of population and volume of traffic may find speedy publication.

Mark Jefferson.

—— **Boston, Consular District of, Trade and Commerce of the, Report for the Year 1914 on the.** 64 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5542. London, 1915.

Hice, R. R. **The Mineral Production of Pennsylvania for the Year 1913.** 108 pp. *Topogr. and Geol. Surv. of Pennsylvania Rept. No. 11.* Harrisburg, 1915. [The mineral production of Pennsylvania—exclusive of derived products—amounted to $506,466,759 in 1913, an increase of 13.5 per cent on the record of 1912.]

—— **Jamaica Bay Improvement, First Unit of, Completed.** Map. *Engineering Rec.*, Vol. 73, 1916, No. 12, pp. 392-393. [Mill Basin, on the western, Brooklyn, shore of the bay. The Jamaica Bay improvement is to furnish additional facilities, especially for handling freight, to the port of New York.]

McSweeney, E. F., Joseph A. Conry, and Lombard Williams. **The Use and Benefits to Massachusetts Manufacturers and Wage Earners of an American Merchant Marine.** 14 pp. Diagrs. *Directors of the Port of Boston Bull. No. 2.* Boston, 1915. [See note in the Feb. *Review*, p. 141.]

—— **Philadelphia, City Planning on an Exceptionally Large Scale . . . . at.** Maps, diagrs., ills. *Engineering Rec.*, Vol. 73, 1916, No. 11, pp. 344-348.

Rand, McNally Commercial Map of Greater New York: Sections A and B. 1:7,200. Rand, McNally & Co., New York, [1915]. [Two white-print maps, covering together Manhattan and the western Bronx, evidently based on the same compilation, although on a larger scale, as the same firm's excellent "New Standard Map of Greater New York," familiar to all travelers on the subway and elevated, which was reviewed at length in the *Bull. Amer. Geogr. Soc.*, Vol. 43, 1911, pp. 795-796. Although the copyright entry bears no date, the map is evidently very recent, as it shows the New York Connecting Railroad and the ferry from Dyckman Street to Englewood, N. J. The 207th Street crosstown surface line over the Harlem is, however, omitted between Broadway and Bailey Avenue.]

Cape Elizabeth to Portsmouth, Maine–New Hampshire. 1:80,000. Chart No. 1205, U. S. Coast & Geodetic Survey, Washington. Edit. of June, 1915. Price, 50 cents.

Portsmouth to Cape Ann, New Hampshire–Massachusetts. 1:80,000. Chart No. 1206, U. S. Coast & Geodetic Survey, Washington. Edit. of June, 1915. Price, 50 cents.

Cohasset Harbor, Massachusetts. 1:5,000. Chart No. 242, U. S. Coast & Geodetic Survey, Washington. Edit. of May, 1915. Price, 30 cents.

Sea Girt Light to Little Egg Inlet, New Jersey. 1:80,000. Inset: Little Egg Inlet, 1:40,000. Chart No. 1216, U. S. Coast & Geodetic Survey, Washington. Edit. of January, 1915. Price, 50 cents.

North-Central States

Flora, S. D. **Tornadoes in Kansas.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 615-617.

Herrold, G. H. **Draining the Roseau River Swamp in Minnesota.** Map, diagrs., ills. *Engineering News*, Vol. 75, 1916, No. 8, pp. 366-368.

Hersey, H. B. **Climatological Data (Annual, 1915): Wisconsin Section.** Maps. *Climatological Data* (Annual), Vol. 20, 1915, No. 13, pp. 99-108. Weather Bureau, Washington, D. C.

Weidman, Samuel, and A. R. Schultz. **The Underground and Surface Water Supplies of Wisconsin.** xxii and 664 pp. Maps, diagrs., index. *Wisconsin Geol. Surv. Bull. No. 35.* Madison, 1915. [Accompanied by a geologic map of Wisconsin, 1:1,000,000, showing artesian conditions and the determinant elevations of the Precambrian.]

South-Central States

Cline, I. M. **Temperature Conditions at New Orleans as Influenced by Subsurface Drainage.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 607. [Author's abstract of paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. "The frequent occurrence of high temperatures at New Orleans in recent years, which general meteorological conditions did not account for, indicated that some local influences are responsible."]

Deussen, Alexander, and R. B. Dolf. **Ground Water in Lasalle and McMullen Counties, Texas.** Maps, index. *U. S. Geol. Surv. Water-Supply Paper 375-G*, pp. 141-181. Washington, 1916. [These districts are semi-arid. Agriculture can depend to a limited extent on irrigation from wells and impounded storm waters, but "most of the land if cultivated at all must be reclaimed by the intelligent application of dry-farming methods."]

ROOSEVELT, THEODORE. **The Bird Refuges of Louisiana.** Map, ills. *Scribner's Mag.*, Vol. 59, 1916, No. 3, pp. 261-280. [Thanks to vigorous action on the part of the State Conservation Commission, created only in 1912, the game and water fowl preserves of Louisiana extend for 75 miles along the Gulf Coast and cover an area of 500 square miles. Already there has been notable increase in the species frequenting the shores for breeding purposes. (See also note on "New Duck Species Breeding in Louisiana," *The Wilson Bull.*, No. 92, 1915.)]

SMITH, E. A. **Statistics of the Mineral Production of Alabama for 1914.** 64 pp. *Geol. Surv. of Alabama Bull. No. 16.* University, Ala., 1915.

Western States

BOLTON, H. E. **Original Narratives of Early American History: Spanish Exploration in the Southwest, 1542-1706.** xii and 487 pp. Charles Scribner's Sons, New York, 1916. $2.50. 9 x 6.

This volume has performed good service in fulfillment of the aim of the series—to render accessible certain important material on early American history. One-third of the material has heretofore been available in Spanish only, and nearly one-third more is from unpublished manuscripts. In addition two important maps, showing respectively the routes of Oñate and De Léon, are here reproduced for the first time, and the whole series of explorations is exhibited on a map compiled from original data.

From New Spain exploration and conquest gradually carried Spanish dominion to the north, into what is now the southwestern United States. Early plans aimed at the settlement of California. In 1542 the Cabrillo-Ferrelo expedition reached as far north as 42° 30′ N. along the Pacific coast. Half a century later the Vizcaino expedition set out with a well-defined objective: an investigation of the possibilities of founding a port of call and defense for the Manila galleons that were wont to find their most practicable return route in a latitude—about 40° N.—far north of Acapulco. Contemporaneously frontiers were being pushed forward in the pueblo district of New Mexico. The Rodriguez (1581) and Espejo (1582-83) expeditions established lines of approach for the province founded by Oñate at the end of the century. The narratives of Oñate's achievements contain much interesting material of a geographical nature—descriptions of the Indian trading expeditions, "An Account of the Discovery of the Buffalo." Somewhat later the frontier was pushed northward into Arizona. Military posts and Jesuit missions led the van, mining and stock raising followed. Most prominent of the pioneer figures of this region was Father Kino, missioner, colonizer, and geographer. He entered Pimería Alta—that part of Arizona later comprehended in the Gadsden purchase—in 1687. He baptized 4,000 Indians, stimulated settlement in Lower California, executed the first authoritative map of southern Arizona, and in his "Cosmographical Demonstration" proved that California was not an island (see "The Isles of California," by Godfrey Sykes, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 745-761). The later seventeenth century saw attention directed towards Texas. The Bosque Larios expedition of 1675 made the first important crossing of the lower Rio Grande, below the confluence of the Pecos. A little later native appeals for help against the Apache influenced the Mendoza-Lopez expedition. Still later the De Léon-Massanet expedition, which, in 1690, founded missions amongst the Tejas, was primarily directed against the reported French occupation of the Gulf Coast.

DILLER, J. S., AND OTHERS. **Guidebook of the Western United States. Part D: The Shasta Route and Coast Line.** 142 pp. Maps, ills., index. *U. S. Geol. Surv. Bull. 614.* Washington, 1915. $1. 9 x 6.

This excellent guidebook and its three companion volumes (reviewed as follows: Overland route, *Bull. Amer. Geogr. Soc.*, Sept., 1915, pp. 697-698; Northern Pacific route, Feb. *Review*, p. 153; Sante Fe route, April *Review*, p. 312) deserve wide circulation. While necessarily restricted in scope and in arrangement by the definite purpose of describing the belt of country adjacent to a railroad route, it is gratifying to note how much of the general physiography and geology of the Pacific Coast is given not only incidentally in the local descriptions but more specifically in the introduction and in footnotes. Remnants of old peneplains and of ocean and river terraces are pointed out at various places from Seattle to Los Angeles and brief explanations given of the crustal movements which can be inferred from them. Peculiarities of stream drainage are frequently noted and their probable evolution described.

Two interesting instances may be mentioned in regions where the regular topographic sheets are available for more detailed study. They are the antecedent course of the Willamette in the gorge between Oregon City and New Era (p. 33) and the superimposed course of the Salinas River in the granite upland northeast of the main valley near Santa Margarita, California (p. 117).

Throughout the volume the illustrations are from well-chosen photographs and in general are so well reproduced that they may be utilized in a reflectoscope or converted into lantern slides.

The volume seems remarkably free from errors. The height of Mount Shasta is given on page 54 as 14,350 feet and on page 56 as 14,380 feet—the reading of the contour map. Mr. F. E. Matthes has recently quoted the U. S. Coast and Geodetic Survey as having revised its measurements and reduced the height to 14,162 feet (*Sierra Club Bull.*, Vol. 9, p. 190). Mount Shasta is so well known that it is to be hoped that there may soon be an agreement on the most accurate determination of its elevation. If the public demand makes a second edition of the series necessary, the index, at present confined to a list of railroad stations, should be extended to physiographic features and general geographic topics. RULIFF S. HOLWAY.

MEXICO AND CENTRAL AMERICA

ADAMS, CYRUS C. **Northern Mexico: The Scene of Our Army's Hunt for Villa.** Map, ills. *Amer. Rev. of Reviews*, Vol. 53, 1916, No. 4, pp. 421-423.

—— **Costa Rica, Trade and Commerce of, Report for the Year 1914 on the.** 13 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5553. London, 1916.

GOLDMAN, E. A. **Plant Records of an Expedition to Lower California.** Map, ills., index. *Contrib. from U. S. National Herbarium*, Vol. 16, 1916, Part 14, pp. 309-371. Smithsonian Institution, Washington, 1916. [The route extended throughout the whole length of the peninsula.]

JUDAY, CHANCY. **Limnological Studies on Some Lakes in Central America.** Maps, diagrs. *Trans. Wisconsin Academy of Sci., Arts, and Letters*, Vol. 18, 1915, Part 1, pp. 214-250. [Abstracted in this number, p. 374.]

—— **Nicaragua, How the United States is Helping: The Ratification of the Nicaragua Canal Treaty the Latest Step in the Effort to Promote the Republic's Prosperity.** Map, ills. *Dun's Rev.: Internatl. Edit.*, Vol. 27, 1916-17, No. 2, pp. 39-44. New York.

RAGUZZI, —. **Il Canale di Panama: 1° anno d'esercizio.** 9 pp. [*Boll.*] *Direz. Gen. degli Affari Commerc.*, 1915, No. 17. Minist. degli Affari Esteri, Rome.

Map of Sonora, Chihuahua, and Coahuila, Mexico. [1:100,000.] War College Division, General Staff, [Washington, D. C.], Dec. 1913. Reproduced for the Pan American Union, Washington, D. C., 1914. [Detailed comment on this map will be found in this number under "Geographical Record" on p. 374.]

WEST INDIES

—— **Barbados: Report for 1914-15.** 15 pp. Map. *Ann. Colonial Repts. No. 871.* London, 1916.

—— **Cuban Prosperity.** *South Amer. Journ.*, Vol. 80, 1916, No. 4, pp. 84-85. London. [The extraordinary sugar crop of 1915-16 points to a forthcoming period of prosperity.]

FREEMAN, W. G. **The Influence of the War on Tropical Agriculture.** Diagrs. *Bull. Dept. of Agric. Trinidad and Tobago*, Vol. 14, 1915, Part 4, pp. 103-107. [Deals specifically with three of the principal products of Trinidad and Tobago—cacao, copra, and sugar.]

GARCÉS, A. D. **Informe del Consulado General de Chile en Cuba, sobre la industria de la pesca.** *Bol. de Relaciones Exteriores*, No. 58, 1915, July, pp. 67-71. Santiago, Chile.

GUTIERREZ-LANZA, MARIANO. **The Climate of Cuba.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 610. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HALL, MAXWELL. **Storms and Hurricanes in Jamaica, 1635-1915.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 620.

KUPFER, H. F. **Porto Rico's Increasing Prosperity: Sugar, Coffee, Tobacco and Tropical Fruits Promise Good Yields and Have Profitable Markets.** Map, ills. *Dun's Rev.: Internatl. Edit.*, Vol. 27, 1916-17, No. 2, pp. 53-57. New York.

—— **Leeward Islands: Report for 1914-15.** 22 pp. *Ann. Colonial Repts. No. 876.* London, 1916.

Millás, J. C. **The Origin and Course of West Indian Hurricanes.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 611. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. "In this paper the results obtained by Father Viñes and the data of the recent investigations carried out by the meteorologic service of the United States are made use of."]

—— **Porto Rico, Trade and Commerce of, Report for the Fiscal Year Ended June 30, 1914, on the.** 17 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5475. London, 1916. [The new Tariff Act passed by Congress in Oct., 1913, has effected a loss on the 1914 sugar crops estimated at about $10,000,000. Had the bill retained its original form and free sugar been admitted after May, 1916, a still more serious blow would have been dealt to the industry.]

—— **Trinidad and Tobago: Report for 1914-15.** 24 pp. Maps. *Ann. Colonial Repts. No. 877.* London, 1916.

van Heekeren, E. A. A. **Nederlandsch West-Indië in 1915.** *De Indische Gids*, Vol. 38, 1916, No. 2, pp. 190-196. [Review of economic development.]

Map of the island of Porto Rico. 1:120,000. Rand, McNally & Co., New York, [1915?].

SOUTH AMERICA

General

Goldsmith, P. H. **A Brief Bibliography of Books in English, Spanish, and Portuguese Relating to the Republics Commonly Called Latin American, with Comments.** xix and 107 pp. Index. The Macmillan Co., New York, 1915. 7 x 5.

We are awakening from our long-protracted ignorance of Latin America. The neglected countries to the south are becoming subjects of popular study. Bibliographies are in demand. For this "emergency" demand the above bibliography, despite its deficiencies, must have a certain value. There are a few serious omissions. There is no recognition of Colonel Church nor, one may add, of another eminent Amazonian explorer, James Orton. Spruce, who contributed so much to our knowledge of the Ecuadorian and north Peruvian *montaña,* is neglected, likewise Hudson, the naturalist. The Argentine-Chilean boundary disputes provoked much literature of value, including Holdich's "Countries of the King's Award"; yet this most readable book finds no place in the bibliography. From the unknown lands of Paraguay has come recent enlightenment at the hands of Barbrooke Grubb, but the bibliography does not note it nor the commentary on the Jesuit Missions of the adjacent territory, Graham's "A Vanished Arcadia." Raimondi is missing from the writers on Peru, and the necessarily short Ecuadorian list is impoverished by the omission of Whymper's "Travels Among the Great Andes of the Equator." There is no mention of Lloyd's series of Twentieth Century Impressions of South American countries; the volumes on Argentina, Brazil, and Uruguay have been published some time. One wonders over the omission of "Through the Brazilian Wilderness" and deplores, perhaps most of all, that of Walle's "Bolivia," both on account of its intrinsic merits and particularly in view of the exceedingly limited material available on modern Bolivia. The critical comments one need not take too seriously; some, however, are not inapt.

Marquez B, Alberto. **Libro Internacional Sud-Americano.** 511 pp. Maps, ills. La empresa Zig-Zag, Santiago de Chile, 1916. 7½ x 10½.

This volume, eloquent indeed of South America, is another of the growing number of contributions to South American propaganda. The specific introduction for its general aim of a more widely known South America was achieved at the San Francisco exposition. The volume comprehends profusely illustrated sections of encyclopedic information on the individual countries, the authorization in each case being due to a member of the diplomatic corps.

—— **Quinine: A South American Gift to Humanity.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 1, pp 61-78. [See the note in this number, p. 375.]

Reid, W. A. **Glimpses of South American Activities To-day.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 3, pp. 325-357.

Babson's map of South America for merchants and bankers [showing trade conditions]. 1:18,000,000. Babson's Statistical Organization, Wellesley Hills, Mass., 1915.

British Isles

Babcock, W. H. **The Races of Britain.** *Sci. Monthly,* Vol. 2, 1916, No. 2, pp. 149-169.

Davison, Charles. **Earthquakes in Great Britain (1889-1914).** Maps, diagrs. *Geogr. Journ.,* Vol. 46, 1915, No. 5, pp. 357-374.

Farrow, E. P. **On the Ecology of the Vegetation of Breckland: I, General Description of Breckland and Its Vegetation.** Maps, diagrs. *Journ. of Ecology,* Vol. 3, 1915, No. 4, pp. 211-226. [''The heath district known as the 'Breck Country' lies in the low-rainfall area of East Anglia, its soil is sandy and porous, and it presents the nearest approach to continental steppe conditions to be found in Great Britain. . . . The dominance of heather (*Calluna vulgaris*), a plant of oceanic and sub-oceanic climates, separates the vegetation sharply from that of true continental steppe.'']

Holmes, T. V. **On the Evidence as to the Geological Structure of Cumberland Bordering the Solway.** Map. *Geol. Mag.,* Decade 6, Vol. 2, 1915, No. 9, pp. 410-418.

France

—— **Bordeaux, Consular District of, Trade and Commerce of the, Report for the Year 1914 on the.** 54 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5525. London, 1915.

—— **Caffé, Il commercio del, all' Havre nel 1914-1915.** *Rapp. dei Agenti Diplom. e Consol.,* No. 23, Dec., 1915, pp. 11-12. Direz. Gen. degli Affari Commerciali, Minist. degli Affari Esteri, Rome.

Coletti, S. **Condizioni di vita e di lavoro in alcuni bacini carboniferi francesi.** Diagr. *Boll. della Emigrazione,* Vol. 15, 1916, No. 1, pp. 3-51. Rome. [Report of an investigation by the author in his capacity of Italian emigration inspector.]

—— **Fierro en Normandia, El.** *Bol. Soc. Nacional de Minería,* No. 219, Vol. 27, 1915, pp. 419-427. Santiago, Chile.

Garçon, Pierre. **Le cours du Giffre et ses vallées.** Maps, ills. *La Montagne,* Vol. 11, 1915, No. 10-12, pp. 187-207. [Alpine valleys in the department of Haute Savoie.]

Moussu, G. **Le troupeau national français et la guerre.** Ills. *La Nature,* No. 2206, 1916, Jan. 8, pp. 17-21. [Cattle supply.]

Switzerland or the Alps

Michel, Gaston. **Verkehrskarte der Schweiz (Carte du Trafic de la Suisse).** 1:200,000. 47°50'-45°42' N.; 5°50'-10°30' E. 8 colors. With two insets: (1) [West-central Europe, showing the main lines of communication.] 1:4,000,000. 5 colors. (2) [Switzerland, showing administrative division of Swiss railroads. 1:900,000.] 7 colors. Engraved by Geograph. Anstalt Kümmerly & Frey, published by Geographischer Kartenverlag, both Bern, [1916].

An excellent map of the transportation lines of Switzerland, equally effective as a wall map to be used at a distance or as a desk map for close consultation. This result is obtained by reinforcing by bands of color the black lines which indicate railroads; while obliterating no details, this produces a bold network of lines which is readily visible at a distance. The ingenious symbolism of the map allows a wide range of expression. Gage and number of tracks are indicated by the kind of black line used; there are also separate symbols for tramway lines, cog-wheel railways, and that typically Swiss means of transportation, the *funiculaire.* The color bands, of a contrasting color, one on each side of a line, indicate by their width the amount of passenger and freight traffic respectively. Similarly, the freight and passenger traffic of a given station is indicated respectively by its symbol and the size of lettering of its name. Some eleven symbols are used for customs bureaus according to their receipts. The routes of the Swiss lake steamers are also differentiated according to the size of their traffic.

The base on which all this is shown is admirably suited to the purpose. Nowhere else has such intensive traffic developed in so rugged a region as in Switzerland, and it is therefore eminently fitting that relief is represented on the map. It must be subdued, however, in order not to mar the main theme; this has been attained by printing the topography in a grayish olive tone which conveys a good general impression of the relief. Closer inspection reveals the fact that the base is an excellent map in itself. Relief is shown by contours (interval 100 meters) and shading. The delicacy of line, especially evident on the glaciers, is the same as on good atlas sheets. Only Swiss cartography—its high development in itself a geographic response to its environment—could afford to use such excellent material as a mere by-product.

The density of the railway net in a zone between Lakes Constance and Geneva reflects the industrial development of this Alpine Foreland region in contrast with the enclosing mountain regions of the Jura and the Alps. The predominance of natural economic forces over political factors is also illustrated by the customs-exempt transitional areas of the ''Zone sarde'' and the ''Pays de Gex,'' tributary to Geneva, and the ''Zollausschlussgebiet von Samnaun und Sampuoir,'' the head of a mountain valley whose natural outlet is to the Tyrol. Another point that the map brings out well is the greater volume of the traffic on the St. Gotthard than on the Simplon route; it also shows that the number of passenger trains predominate over freight trains on the Simplon, while both categories are equal on the St. Gotthard. The latest trans-Alpine tunnel, the Lötschberg, opened in June, 1913, which connects Bern directly with Milan, and, before the war, afforded a more direct route than heretofore between Italy and northern France, Belgium, and England, is, of course, indicated.

The only defect is the absence of any indication as to the date used as a basis for the conditions represented.

KREUZKAM, THEODOR. **Wirtschafts- und Verkehrsverhältnisse der Schweiz unter den Wirkungen des Krieges.** *Weltwirtschaft,* Vol. 5, 1915, No. 9, pp. 182-184. Berlin.

GERMANY

DREYER, JOHANN. **Die Moore Pommerns: Ihre geographische Bedingtheit und wirtschaftsgeographische Bedeutung.** Maps, diagrs., ills., bibliogr. *Jahresbericht der Geogr. Gesell. zu Greifswald,* Vol. 14, 1913-14, pp. 1-319. Greifswald, 1914.

If the name of the region described in this treatise were omitted and one were to try to guess its whereabouts, the muskeg lands of northeastern Minnesota would fit equally well. In fact some of the photographs could very easily have been taken in this region. Hence the volume under consideration has a peculiar interest to the American.

The author presents a summation of the conditions in the moorlands of Pomerania, Germany, within 192 pages of text, three extensive tabulations covering 118 pages, a comprehensive bibliography that would seem to include all of the German literature on bogs or swamps, two maps, and nine photographs. Most of the data of years past have never before been presented in available form. The purpose of the author, however, was not merely to compile data, but to present the geographic influences effective in the reclamation of the vast swamp area of Pomerania and to show the possibilties of its economic development.

The theory of climatic and topographic influences upon the formation of a swamp is tested and applied. The writer asserts that the swamp constitutes an index to climatic conditions. It is argued that since a definite type of climate controls swamp building, geologic records that show the former existence of swamps thereby give the key to some of the climates of the past.

The physical and chemical composition of the swamp lands in various stages as found in different parts of the province is given in detail. This should prove of value to those especially interested in the cultivation of similar lands. Of equal value is the discussion of the results of practical work done up to date and the methods whereby success has been attained.

Stettin's supply of vegetables is grown upon these lands. The raising of truck-garden products and the use of the remainder of the land for pasturage to supply the meat and dairy products offer a most promising future. The extraction of peat for fuel, the derivation of ammonia, and the use of certain parts of the soil for medicinal baths are among the industrial uses mentioned. The author concludes that in addition to the products to be derived from swamp lands, the effect of their cultivation upon the elimination or reduction of disease is worth much in itself. EUGENE VAN CLEEF.

HECHT, H. H. **The Motor Routes of Germany Through North-Eastern France and Holland, to the Rhine, the Moselle, the Black Forest, the Thuringian Forest, the Taunus, and Bavaria.** Edited by Gordon Home. xxiv and 456 pp. Maps, ills., index. A. & C. Black, London, 1914. 5s. 8½ x 5½.

A very complete handbook for motorists who, before the war, designed to tour Germany. The route maps and town plans are simply and clearly drawn and are easy to understand. Brief historical information about the different places is given. A large and well-executed motor map of Germany is added. The book leaves little to be desired in the way of a practical guide for actual use by the experienced motorist.

David H. Buel.

Krüger, Gustav. **Über Sturmfluten an den deutschen Küsten der westlichen Ostsee, mit besonderer Berücksichtigung der Sturmflut vom 30./31. Dezember 1904.** Map, diagrs. *Jahresbericht der Geogr. Gesell. zu Greifswald,* Vol. 12, 1909-10, pp. 195-294. Greifswald, 1911.

The Baltic Sea, separated as it is from the North Sea by the narrow passages of the Belts, experiences very slight changes of level due to tidal forces. Like the nearly enclosed Albemarle and Pamlico Sounds, its greatest variations of surface level result from the action of winds in piling water up against the low bordering coasts. Southerly winds drive the water into the Gulf of Bothnia, giving high water around its borders and low water along the shores of southern Sweden and northern Germany. With northerly winds, the condition is reversed, and Trelleborg and Malmö, together with many of the German coast cities, find their streets invaded by the rising waters. The same wind which raises the water level drives high waves against exposed portions of the flooded coasts, enormously increasing the damage done by these ''storm tides,'' as they are commonly called.

Gustav Krüger has performed a useful service in publishing a critical survey of the more important reports on such of these storm tides as have affected the German coast from the earliest trustworthy description of a storm in the year 1044, to the disastrous flood of December, 1904. On the basis of this study of the literature, Krüger presents a chronological table of 79 recorded storm tides and finds that on an average six important disasters of this nature occur in each century. The data for the last three centuries are most complete and permit the author to distinguish periods of frequent storm tides, alternating with periods in which their occurrence is rare. An attempt is then made to correlate the storm-tide period with the Brückner cycle of wet and dry climatic variations, and it is pointed out that the Brückner dry periods of 1781-1805 and 1856-1870 coincide closely with the frequent storm-tide periods 1784-1801 and 1855-1874 respectively. Krüger concludes that periods of frequent storm tides can in general be shown to agree with Brückner dry periods and vice versa. The fact that the period of storm-tide frequency 1736-1750 coincides with the *wet* period 1736-1755, while the frequency period 1820-1825 occurs in the *wet* period 1806-1825, is in apparent disagreement with the author's conclusion.

The final part of Krüger's paper is devoted to an elaborate discussion of the great storm-tide of December 30-31, 1904, including a review of previous descriptions of this event. It appears that westerly winds prepared the way for the coming disaster by driving much water from the North Sea into the Baltic, thereby giving an abnormal height to the surface of the latter. Northeast winds then piled the water up against the low coast of northern Germany to a height in places eight feet above mean water level. The details of areas flooded, coast margins eroded, and artificial structures demolished bring vividly to mind the similar destruction wrought along the New Jersey coast by the great storm of January 4, 1913. D. W. Johnson.

Russia

Williams, H. W. **Russia of the Russians.** ix and 430 pp. Map, ills., index. Charles Scribner's Sons, New York, 1915. $1.50. 7½ x 5½.

An elevated and scholarly description of the development and present state of Russia and Russian institutions. At the very start the importance and influence of the geographical factor is recognized. A striking contrast is drawn between an island-dwelling people, like the British, and a plains-dwelling people, such as the Russians, and the whole course of Russian history is shown to be the outcome of life on a plain, increasing and expanding until the barriers of sea and mountain are reached. The account is a candid and unbiased statement of facts as they are in Russia—its bureaucracy and its constitution, its press, the church and the people, its literature, music, theater, art, and architecture, its peasants and landed proprietors, and finally its great city, now known as Petrograd. A chapter on the *intelligentsia* is worthy of note. In this, the educated class, Russian idealism and devotion to the altruistic service of humanity find their highest expression. David H. Buel.

Bienaimé, Georges. **La Pologne.** *La Géogr.,* Vol. 30, 1914-15, No. 5, pp. 337-358. Paris.

Borissov, A. **Amélioration des voies ferrées dans le nord de la Russie.** *Bull. Soc. Géogr. Comm. de Paris,* Vol. 37, 1915, No. 10-12, pp. 305-326. [Deals with the

Viatka-Kotlas, Vologda-Archangel, and Petrograd-Kola routes, all shown on the map in the February *Review*, p. 130, and the last two described in the article which it illustrates.]

—— **Cotton Industry in 1915, Russian.** *Commerce Repts.*, 1916, No. 48, pp. 812-813. Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C., 1916. [Reprinted from the *Journ. Russian-Amer. Chamber of Comm.*, Nov., 1915.]

—— **Odessa, Consular District of, Trade of the, Report for the Year 1914 on the.** 80 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5544. London, 1915.

—— **Russian Commercial Ports.** *Commerce Repts.*, Ann. Series, 1916, No. 42. pp. 718-719. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [From the *Journ. Russian-American Chamber of Comm.*, Dec., 1915.]

—— **Ukraine, The Cry of.** Map. *Amer. Rev. of Reviews*, Vol. 53, 1916, No. 4, pp. 485-486. [Based on an appeal published by the National Ukrainian Association pleading the racial unity of the Ukrainians, at present politically divided as Little Russians in Russia and Ruthenians in Galicia and northern Hungary.]

AUSTRIA-HUNGARY

GAYDA, VIRGINIO. **Modern Austria: Her Racial and Social Problems, with a Study of Italia Irredenta.** [Abridged translation, from the second edition of the Italian original, by Z. M. Gibson and C. A. Miles.] 350 pp. Index. Dodd, Mead & Co., New York, 1915. $3. 9 x 5½.

None but an Italian conscious of the intertwining of his country's history with that of Austria and mindful of his countrymen's liberation from the Austrian yoke could have interpreted the twilight of the Austro-Hungarian monarchy with such lucidity. By the spirited rendering which makes the work accessible in an English dress the translators have extended their good services to two hemispheres.

Passing in review the various Austrian nationalities, the author not unnaturally dwells longer on the unredeemed portions of his country. The scientific foundation of the peopling of the Trentino by Italians is correctly stated to be a result of the prolongation of Italian valleys north of the Italo-Austrian frontier. On the other hand, to pretend that Istria with its "Italian population" should belong to Italy is to affirm the unwarranted, since the peninsula is peopled mainly by Slavs, its western edge alone having been settled by Italians. A distinct loss in the value of the work is incurred by occasional slips of this character.

The book stands somewhat apart from publications dealing with the same subject in that it gives an unusually brilliant exhibition of the peculiarities of Austro-Hungarian social life which owe their distinctiveness to the forcible mingling of peoples of incompatible temperament.

DE LUCCHI, GUIDO. **Trentino e Tirolo (Aprile 1914).** 82 pp. [*Boll.*] *Direz. Gen. degli Affari Commerc.*, 1915, No. 16. Minist. degli Affari Esteri, Rome.

[Five maps in one:] 1, Ethnographical map of Austro-Italian frontier, 1:2,000,000; 2, The western Trentino, physical, 1:1,000,000; 3, Present and proposed frontiers in the Trentino, 1:1,000,000. 4, Present and proposed frontiers north of Trieste, 1:1,000,000; 5, The western frontier of Montenegro, 1:2,000,000. Accompanies "The Southern Frontiers of Austria" by D. W. Freshfield, *Geogr. Journ.*, Vol. 46, 1915, No. 6.

BALKAN STATES, INCLUDING RUMANIA

NEWBIGIN, M. I. **Geographical Aspects of Balkan Problems in Their Relation to the Great European War.** ix and 243 pp. Maps. G. P. Putnam's Sons, New York, 1915. $1.75. 8½ x 5½.

This timely volume by the editor of the *Scottish Geographical Magazine* is intended "to summarize those geographical facts which made the Balkan Peninsula the potential storm-center of Europe." Physical, political, and historical geography are laid under tribute to broaden the reader's acquaintance with the complicated issues which render the Balkan "problem" so difficult from every point of view. The folded mountains of the western coast, which shut off the central and eastern states from free communication with Italy, the central upland of Rhodope and the important furrows formed by the Morava-Vardar and Morava-Maritza valleys, and the various rivers characterized by "unnatural," right-angled bends, are discussed at length, and their effects on the migrations, political development, and racial peculiarities of the people considered. A chapter is devoted to the past history and probable future development of the main trade routes of the peninsula, in which emphasis is laid on the significant fact that both the ancient Roman roads and the modern railways were built to cross the region rather than to develop it. Special attention is given to the policies of Austria and Turkey in the Balkans, and it is shown that these policies have been largely affected by the physical features of the region. The influence of climate is not overlooked, and the agricultural practices of the different states are compared. Each chapter is followed by a list of references to the literature of the subjects discussed; and the book is illustrated by several text maps and an excellent orographical map in colors, most of which have already appeared with the author's earlier brief article on "The Balkan Peninsula: Its People and Its Problems" in the *Scottish Geographical Magazine* for June, 1915.

It is in her discussions of physiographic changes in the Balkan Peninsula that the reader must hesitate to follow the author with full confidence. In particular, the treatment of drainage modifications in Chapter V is open to criticism, since it is largely based on two erroneous assumptions: that the submergence of the lower part of a river by increasing the average steepness of its course increases the erosive power of its headwaters; and that a sharp elbow turn in a river ordinarily means that river capture has taken place. The series of captures described by the author are in the highest degree improbable. However, such defects as these may be charged not so much to original mistakes of the author as to a failure in discriminating between probable and improbable theories as presented by other workers in the Balkan field. As a whole the book is a valuable summary of many important phases of Balkan geography.

D. W. JOHNSON.

ITALY

MAGRINI, GIOVANNI. **Studi fitogeografici sulla laguna di Venezia.** viii and 348 pp. Index, bibliogr.; separate volume of tables. *Ufficio Idrografico Pubbl. N. 54.* R. Magistrato alle Acque, Venice, 1913.

The Italian Hydrographic Office has published in this volume an elaborate study of the vegetation of the coast of the Adriatic Sea from the mouth of the Tagliamento to that of the Adige. A full and well-illustrated description is given of the littoral, lacustrine, and subcontinental portions of the area. This primary subdivision is made on the basis of physiography rather than vegetation, for in each area is to be found a series of communities, from dunes or marshes to arborescent or shrubby vegetation. The descriptive treatment is chiefly floristic, and no attempt is made to work out the successional phenomena involved. The littoral area embraces moving and stable dunes, meadows, and woods of *Quercus ilex* and the introduced *Pinus pinea.* The lacustrine area presents conditions varying from moist to dry and from saline to fresh and is mainly covered by halophytic flats or fresh marshes. The subcontinental area exhibits several types of marsh and a low woodland of *Quercus pedunculata* and other broad-leaved trees. Much space is devoted to the discussion of the broader aspects of work of this character, as for example the general relation of environmental conditions to plant activity, the "adaptive" features of plant structure, variability, polymorphism, etc. There is a full account of the history of botanical work in the vicinity of Venice, a list of the flora with habital notes, and a lengthy bibliography of papers on the ecology of dunes and littoral and palustrine areas.

This work has been done with such thoroughness and such adequate attention to its general bearings that subsequent investigators of similar areas in southern Europe will be free to make their work of a more intensive character. FORREST SHREVE.

—— **Annuario Statistico Italiano: Seconda Serie, Vol. IV: Anno 1914.** xii and 502 pp. Maps, diagrs., index. Direz. Gen. della Statistica e del Lavoro, Rome, 1915. 10½ x 7½. [The fourth volume of the revised series. Contains under a single cover the statistical data collected by the various Italian government bureaus. Tables often accompanied by analytical notes. Valuable information on Italy's colonial domain.]

CORBINO, EPICARMO. **L'emigrazione italiana dopo la guerra, e la politica relativa.** *Riv. Colon.,* Vol. 10, 1915, No. 11, pp. 654-669. Ist. Colon. Italiano, Rome.

DU RICHE PRELLER, C. S. **The Moraine Walls and Lake Basins of Northern Italy.** Maps, diagr. *Geol. Mag.,* Decade 6, Vol. 2, 1915, No. 9, pp. 403-410.

DU RICHE PRELLER, C. S. **The Carrara, Massa, and Versilia Marble District.** Map, diagrs. *Geol. Mag.,* Decade 6, Vol. 2, 1915, No. 12, pp. 554-565.

—— **Emigrazione italiana per l'estero avvenuta nell' anno 1914.** *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 375-378. Novara.

GORTANI, MICHELE. **La frana di Clauzetto (marzo-aprile 1914).** 28 pp. Map, diagrs., ills. *Ufficio Idrografico Pubbl. N. 65.* R. Magistrato alle Acque, Venice, 1915. [Describes an earth-slip in the foothill region of the Venetian Alps. The geological maps and profiles and the photographs illustrate conditions before and after the slip.]

Grazia, Paolo de. **Frane recenti in Basilicata.** Ills. *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 319-329. Novara. [Recent earth-slips in southern Italy.]

Leone, Andrea. **A proposito di alcune recenti guide dell' Ossola.** *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 330-337. Novara. [Guide books on the Alpine valley forming the Italian adit to the Simplon Tunnel route.]

Magrini, Giovanni. **Superficie dei bacini montani della regione veneta.** 51 pp. Maps. *Ufficio Idrografico Pubbl. N. 62.* R. Magistrato alle Acque, Venice, 1914. [Planimetric measurements of the mountain sections of the river basins of the province of Venice, based on the Italian topographic map in 1:100,000. The basins and their subdivisions are outlined on transparent maps in 1:200,000 accompanying the report which may be superposed for purposes of comparison on the sheets of the Italian topographic map on that scale.]

Magrini, Giovanni. **La segnalazione del tempo per il porto di Venezia.** 19 pp. Diagrs., ills. *Ufficio Idrografico Pubbl. N. 57.* R. Magistrato alle Acque, Venice, 1915.

—— **Migrazioni periodiche interne (anni 1910-1911).** *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 378-381. Novara.

Poli, Aser. **Per la pronunzia dei nomi geografici italiani.** *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 350-354. Novara.

Taramelli, Torquato. **Le montagne dove si combatte.** Ills. *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 294-313. Novara. [Alpine battlefields of the Italo-Austrian frontier.]

—— **Uva e vino: produzione media del quinquennio 1909-1913.** *La Geogr.,* Vol. 3, 1915, No. 7-10, pp. 371-375. Novara.

Zappulla, C. N. **Le Eolie.** Bibliogr. *L'Esplorazione Commerc.,* Vol. 30, 1915, No. 10-11, pp. 365-377. Milan. [The Lipari, or Aeolian, Islands.]

AFRICA

General

Ankermann, Bernhard. **Verbreitung und Formen des Totemismus in Afrika.** Map. *Zeitschr. für Ethnologie,* Vol. 47, 1915, No. 2-3, pp. 115-180. Berlin. [With a map of Africa showing the distribution of totemism.]

Migeod, F. W. H. **Notes on West Africa according to Ptolemy.** Diagr. *Journ. African Soc.,* No. 56, Vol. 14, 1915, pp. 414-422. [With a note by Sir Harry H. Johnston, pp. 423-426.]

Quesnel, G. **Les Allemands en Afrique.** *Soc. Languedocienne de Géogr.,* Vol. 38, 1915, No. 3, pp. 159-193. Montpellier.

Congo Basin and Lower Guinea

—— **Angola Portoghese: Note su una regione dell' altipiano di Benguella.** *Rapporti dei RR. Agenti diplomatici e consolari N. 16,* pp. 1-5. Direz. Gen. degli Affari Comm., Minist. degli Affari Esteri, Rome, August, 1915.

Diniz, Ferreira. **Protecção e assistencia ás populações indigenas da provincia de Angola.** *Bol. Soc. de Geogr. de Lisboa,* Vol. 33, 1915, No. 7-8, pp. 274-319. [A social and economic study.]

Pereira do Nascimento, J. **La colonisation du plateau sud d'Angola.** *Bol. Soc. de Geogr. de Lisboa,* Vol. 33, 1915, No. 7-8, pp. 253-273; No. 9-10, pp. 351-355. [Of the 40,000 emigrants annually leaving Portugal 90 per cent go to Brazil. Many from Madeira and the Azores prefer the United States (Boston and San Francisco); the remainder is directed to the Hawaiian Islands, Trinidad, and British Guiana. So far Portugal has failed to establish an emigration current to her African colonies. The suitability of the Benguella plateau for such a purpose is favorably considered in this article.]

Schwetz, J. **Preliminary Note on the General Distribution of *Glossina Palpalis, Rob-Desv.,* in the District of Lomami, Belgian Congo.** Map. *Annals of Tropical Medicine and Parasitology,* Vol. 9, 1915, No. 4, pp. 513-526. Liverpool. [On the conditions of moisture and vegetation determining the distribution of the tsetse-fly.]

EAST AFRICA

HOBLEY, C. W. **The Alleged Desiccation of East Africa.** Map, diagr., ills. *Journ. East Africa and Uganda Nat. Hist. Soc.*, Vol. 5, 1916, No. 9, pp. 4-16. (Reprinted, without statement to that effect, from *Geogr. Journ.*, Vol. 44, 1914, pp. 467-477.)

Northward of Mombasa the East African coast is thickly studded with ruins of age and origin unknown. By the author of the above paper they are considered to represent a colonizing venture on the part of the Himyaritic Arabs at a period of greater rainfall when the hinterland of this part of British East Africa and Somaliland enjoyed better facilities for stock-raising. The objective of the coast settlements would then be trading between this richer hinterland and the densely peopled *Arabia Felix.* The paper also takes up a short discussion of evidences of climatic change in geological time. It was contributed in response to Prof. J. W. Gregory's survey of evidence for world desiccation, "Is the Earth Drying Up?" (*Geogr. Journ.*, Vol. 43, 1914).

SCHLIKKER, BERNHARD. **Beitrag zu den Regenverhältnissen im küstennahen Gebiete von Deutsch-Ostafrika.** Inaugural-Dissertation . . . Univ. Münster. 42 pp. Maps, diagrs. E. S. Mittler & Sohn, Berlin, 1915. 12 x 9½.

German East Africa is a region for which climatic data have been accumulating with remarkable rapidity in the last few years. Von Danckelmann, Maurer, and others have already given us valuable reports on its climate. Particular interest attaches to the rainfall, because of the very striking differences which have been found to exist in the amounts of precipitation in different parts of the area. There are all gradations, from a dry steppe to tropical abundance of vegetation. The available rainfall data for the littoral portion of German East Africa (east of 36½° E.) are selected and reduced in this thesis, and on them is based a new rainfall map (listed below), which differs in some respects from the earlier maps of Fitzner (1907) and Maurer (1900). The maximum mean annual rainfall exceeds 2000 mms. (78.74 ins.) on some of the higher elevations, and the minimum is below 750 mms. (29.53 ins.). The six months December to May (or November to April) are the rainiest part of the year. The district thus belongs to the southern hemisphere régime of a summer (high sun) rainfall maximum. The variations in the annual amounts are considerable over the whole area. The results presented in Doctor Schlikker's monograph are acknowledged to be preliminary, and as such will doubtless be subject to more or less modification in future years, as more reliable data, covering longer periods, become available for discussion. Nevertheless, this new rainfall map and the critical discussion accompanying it will for a good many years, at any rate, remain the standard publication for this portion of eastern Africa.

R. DEC. WARD.

Niederschlagskarte des östlichen Deutsch-Ostafrika. Entworfen v. Bernhard Schlikker. 1:2,000,000. Accompanies "Beitrag zu den Regenverhältnissen im küstennahen Gebiete von Deutsch-Ostafrika," von B. Schlikker, E. S. Mittler & Sohn, Berlin, 1915. [See review immediately above.]

SOUTH AFRICA

CALDECOTT, W. A. **Some Features of the Rand Gold Mining Industry.** *South African Journ. of Sci.*, Vol. 12, 1915, No. 4, pp. 113-123. Cape Town.

—— **Commerce de la France et de ses colonies avec l'Afrique du Sud britannique, Note sur le.** *Bull. Écon. du Gouv. Gén. de la Colon. de Madagascar et Dépend.*, Vol. 15, 1915, No. 1, pp. 129-139. [In 1913, a normal year, total trade between British South Africa and France and the French colonies was less than 1 per cent.]

FULLER, C. **Termite Economy.** *South African Journ. Sci.*, Vol. 12, 1915, No. 2, pp. 60-64. Cape Town. [The author claims that the "park-formation" in South Africa is entirely due to termite activities.—Entry taken from review in *Rev. of Applied Entomology, Ser. A: Agricultural,* Vol. 3, 1915, Part 12, pp. 756-757, Imperial Bureau of Entomology, London.

PÉRINGUEY, L. **The Bushman as a Palaeolithic Man.** *Trans. Royal Soc. of South Africa,* Vol. 5, 1915, Part 3, pp. 225-236. Cape Town.

ASIA

TURKEY IN ASIA, ARABIA, CAUCASIA, IRAN

JASTROW, MORRIS, JR. **The Civilization of Babylonia and Assyria: Its Remains, Language, History, Religion, Commerce, Law, Art, and Literature.** xxv and 515 pp. Map, ills., index. J. B. Lippincott Co., Philadelphia and London, 1915. 9½ x 6½.

This survey of the ancient civilization of a natural region has the advantage of being presented by a fully qualified worker. It shows in the main that human progress in Mesopotamia has traveled northwards along the channels provided by its great twin river system. Copious translations of tablets bring the daily life of the Babylonians and Assyrians within the reader's range of vision. The conditions under which the farmers of Babylon worked their artificially irrigated lands or those under which the trader of Nineveh carried on his commerce are made clear. Social conduct in the great cities is revealed. Tenure of real estate, laws regarding personal property, marriage, and divorce, worship of different cults in their respective sanctuaries, are so many fragments which the author has assembled in the endeavor to create a mosaic of the complex life formerly led by the dwellers on the banks of the Tigris and Euphrates.

The relation of the subject to time is presented far more satisfactorily than that to space. True, some archeologists might have preferred to see the date of the Hammurabi period set at a century earlier than *circa* 2000 B. C., as given on page 54. But the last word in both Babylonian and Assyrian chronology has not yet been stated. In dealing with the position of these civilizations on the map, however, the facts are not quite as uncertain. It is doubtful whether the physical conditions prevailing at the time in which we obtain these early glimpses of political and social conditions have changed appreciably. The confinement of culture to the truly Mesopotamian area, its backward state in the desert on the west or toward the mountains on the east are facts which influenced Babylonian and Assyrian civilization, especially the latter. The northerly spread of progress can be explained geographically with these considerations in mind. That is why the lack of a preliminary description of the aspect of the land on which this remarkable evolution has taken place is to be deplored. That is also why we think that the liberality which has presided over the selection of the illustrations could have been extended most advantageously to a choice of maps on which the physical foundations of Babylonian and Assyrian history would have been represented.

MANCHURIA, KOREA, JAPAN

CLEMENT, E. W. **A Short History of Japan.** x and 190 pp. Map, ills., index. University of Chicago Press. Chicago, 1915. $2.50. 8 x 5. [An appendix entitled "Physiography" contains a conventional enumeration of geographic elements.]

MUÑOZ, CARLOS. **Memoria anual del cónsul general de Chile en el Japón correspondiente a 1914.** *Bol. de Relaciones Exteriores,* No. 59, 1915, August, pp. 1-71, Santiago, Chile.

—— **Nagasaki, Trade of, Report for the Year 1914 on the.** 21 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5535. London, 1915.

—— **Yokohama, Consular District of, Trade of the, Report for the Year 1914 on the.** 25 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5545. London, 1916.

CHINA

—— **Pakhoi, Consular District of, Trade of the, Report for the Year 1914 on the.** 8 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5554. London, 1916.

—— **Port Trade Statistics and Reports: Frontier Ports (Lungchow to Yatung) and Kiaochow Statistics.** 86 pp. *China Maritime Customs Statist. Series Nos. 3 and 4 (Returns of Trade and Trade Repts.),* 1914, Part 2, Vol. 5. Shanghai, 1915.

—— **Trade, Analysis of Foreign: Exports.** 443 pp. *China Maritime Customs Statist. Series Nos. 3 and 4 (Returns of Trade and Trade Repts.),* 1914, Part 3, Vol. 2. Shanghai, 1915.

INDIA

FRIPP, M. **Irrigation in India, With Especial Reference to Influence on Topography.** *Geogr. Teacher,* No. 42, Vol. 8, 1915, Part 2, pp. 118-124. London. [Abstracted in the April *Review,* p. 302.]

HAYDEN, H. H. **The Mineral Production of India During 1914.** *Records of Geol. Surv. of India,* Vol. 45, 1915, Part 3, pp. 158-208.

MARTINEAU, ALFRED. **Les origines de Mahé (de Malabar).** Maps. *Rev. de l'Histoire des Colonies françaises,* Vol. 3, 1915, Quart. 1, pp. 5-98; Quart. 2, pp. 129-234; Quart. 4, pp. 431-536. Paris.

SMITH, J. A., JOSE DE OLIVAREZ, AND J. O. LAING. **British India: Calcutta, Madras, Karachi.** 32 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 50a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Volterra, E. T. **L'India e la penetrazione economica italiana.** *Riv. Colon.,* Vol. 10, 1915, No. 11, pp. 633-653; No. 12, pp. 709-724. Ist. Colon. Italiano, Rome.

[Topographic map of India]. 1:253,440. (a) Without altitude tints. Sheets: 46L; 47M; 48L; 54I, J, M; 55B, C, D, F, G, K, L, O; 56B, C, J; 63A, C, D, F, G, H, K, L; 64D, O, P; 65A, K, L, M, N, O; 74A, B, 1; 85M, 94F. (b) With altitude tints. Sheets: 39J; 43C; 48L; 55L; 85M; 94F. Survey of India, Calcutta, 1913-15.

India and Adjacent Countries. 1:1,000,000. Sheets: 18; 65 and part of 66; 92. Survey of India, Calcutta, 1913-15.

AUSTRALASIA AND OCEANIA

Australia, New Zealand

Duncan, Norman. **Australian Byways.** 294 pp. Ills. Harper & Brothers, New York, 1915. $1.75. 8½ x 5½.

A British traveler's story of his tour from England, through the hinterland of Australia, thence to Papua, Thursday Island, and Singapore. To him sampans "sob" and lighthouses are "sun-soaked." The personal peculiarities of his fellow travelers are described in a breezy, familiar vein. The most interesting chapter is taken up with an account of the unusual powers of the blacktrackers, or bushmen, who trace criminals by their footprints, in a way that would excite the envy of a Sherlock Holmes. They are said to discern from the traces of the feet of their quarry not only the direction of flight but the height, weight, age, and physical condition of the person they are tracking. The exploits of the Queensland Mounted Police parallel the deeds of daring of the Northwest Mounted Police of Canada. The book makes entertaining reading for those who are fond of works of travel written in a conversational style.

David H. Buel.

Taylor, Griffith. **The Climatic Control of Australian Production.** 32 pp. Maps, diagrs. *Commonwealth Bur. of Meteorol. Bull. No. 11.* Melbourne.

In view of the postponed publication of the Federal Atlas of Australia the editor-elect has here brought together some of the important data in hand for a study of the distribution of three leading Australian products—cattle, sheep, and wheat. From the isothermal and isohyetal relations of the present distribution—shown in map form—in the several provinces future possibilities are deduced. In the better developed eastern areas the principal control of cattle appears to be the 20-inch isohyet. Much of the east, at least of the southern portion, has attained its maximum capacity for cattle, but vast areas, climatically suitable, await development in the Northern Territory and the Kimberley district of Western Australia. Sheep, in general occupying areas complementary to cattle, find optimum conditions in regions with a rainfall of 15 to 20 inches in Queensland, somewhat higher to the south. The southwestern portion of Western Australia, analogous in many respects to the great sheep-grazing fields of New South Wales, offers the greatest prospects for expansion. In respect of wheat the 10-inch isohyet for the growing season exercises the primary control, with 20 or 15 inches to 10 inches as the optimum rainfall over most of the country. Of virgin regions still remaining, parts of New South Wales and Western Australia are suitable for cultivation similar to that at present obtaining. So far all the wheat grown is harvested in summer, and the temperature of the growing season appears to have been an important control. Climatic comparison with wheat-producing regions in the United States (Texas) and northern India show respective likeness with the Brisbane district of Queensland and the east-central part of that province. By the introduction of new varieties, the durum wheat, for example, northward extension of the wheat-growing zone seems possible.

Ball, L. C. **The Einasleigh Freehold Copper Mine, N. Q.** 31 pp. Maps, diagrs., ills. *Queensland Geol. Surv. Publ. No. 246.* Brisbane, 1914.

Dixon, Russell. **Index (No. 5) to Publications Nos. 215 to 226 (Vol. 3 of New Series).** 52 pp. *Geol. Surv. of Queensland Publ. No. 227.* Brisbane, 1914.

Fraser, Malcolm. **Statistics of the Dominion of New Zealand for the Year 1914, Vol. 2: Shipping and Trade.** xx and 472 pp. Index. Wellington, 1915.

Godfrey, J. R. **Report upon the Ardlethan Tinfield.** 77 pp. Diagrs. *New South Wales Geol. Surv. Mineral Resource Series No. 20.* Sydney, 1915.

Hutchins, D. E. **The Forests of Australia.** *Trans. Royal Scottish Arboricultural*

Soc., Vol. 30, 1916, Part 1, pp. 34-43. Edinburgh. [From an article contributed to the *Melbourne Argus* by the author.]

QUAYLE, E. T. **Relation Between Cirrus Directions as Observed in Melbourne and the Approach of the Various Storm Systems Affecting Victoria.** 27 pp. Maps, diagrs. *Commonwealth Bur. of Meteorol. Bull. No. 10.* Melbourne, 1915. [Abstracted in this number, pp. 376-377.]

SAINT-SMITH, E. C. **Geology and Mineral Resources of the Stanthorpe, Ballandean and Wallangarra Districts (with Notes on the Silver Spur Mine, Texas), Southern Queensland, 1913.** 165 pp. Maps, diagrs., ills. *Queensland Geol. Surv. Publ. No. 243.* Brisbane, 1914. [From the inception of mining operations in 1872 to the end of 1912 the Stanthorpe district accounted for 36.7 per cent of the total tin output of Queensland.]

—— **Water Supply and Irrigation in Australia.** *Geogr. Journ.*, Vol. 46, 1915, No. 5, pp. 380-384.

Geological map of New South Wales. 1:1,000,000. Department of Mines, Sydney, 1914.

POLAR REGIONS

ANTARCTIC

PRIESTLEY, R. E. **Antarctic Adventure: Scott's Northern Party.** 382 pp. Maps, diagrs., ills., index. E. P. Dutton & Co., New York, 1915. $5. 9 x 5½.

This is the story of Captain Scott's northern party on his last expedition to Antarctica. It numbered six men under the leadership of Commander V. L. A. Campbell, R. N. It was sent from Scott's base camp at Ross Island in January, 1911, to Cape Adare, over 400 miles north, to make geological, zoölogical and meteorological studies there and along the coast to the south. The book is purely popular, with only occasional references to the scientific work, all details of which were reserved for the scientific reports of the expedition.

The author was the geologist and meteorologist. His book gives vivid impressions of the environment, including animal life. It is good reading, though too prolix in its chronicle of the most trivial details of personal relations and ordinary incidents during their first happy and prosperous year.

But there is nothing commonplace in the history of the second year, farther south near Evans' Coves, where the six men, through the darkness of the winter night, fought for bare life in such misery as explorers have seldom met. They lived through it, though reduced to half their weight, and sledged south to the main camp two years after they had left it; and the first news they heard was of Scott's tragic death.

In January, 1912, the *Terra Nova* took them south to the second field of their work within view of Mt. Nansen. The vessel was to return for them in about a month but she never came. In fact, she made three attempts to reach them but was stopped by heavy pack ice and finally went on to Australia. The men had neither food nor clothing to meet another winter but they had to face the situation. Their supplies were nearly exhausted and, when winter came, they had not succeeded in killing enough seal and penguin to last through.

They tunneled a large snowdrift, and in this hole in the snow, walled in with ice blocks and biscuit boxes, they existed for seven months. Their cave was nine by twelve feet in size. Two tents were used as cook rooms, for it was not safe to heat the cave. Blubber, with unraveled rope for lampwick, supplied dim illumination. Soon after darkness came they were reduced to half rations, with a biscuit apiece daily and an occasional bit of sugar, chocolate, or cocoa. Living almost altogether on a meat diet, they suffered from the lack of carbohydrates but discovered that seal liver supplied this need to some extent. The smokers suffered much when their supply of tobacco gave out.

The party was finally reduced to one meager meal a day and was facing starvation when, on May 6, the hunters had the great good fortune, in the dim light, to kill four emperor penguins that were in splendid condition and dressed over eighty pounds of meat each. This supply of good food saved their lives. They much preferred penguin to seal meat, but it was the latter that pulled them through, for three large seals came next into the larder, and there was meat and blubber till plenty of game came with the sunrise in August. The men were their own relief party. They hauled a sledge down the coast and rejoined their comrades at Ross Island. They were not able to do any scientific work in their second year.

CYRUS C. ADAMS.

SEWARD, A. C. **Antarctic Fossil Plants.** 49 pp. Maps, ills. *British Antarctic ("Terra Nova") Expedition, 1910, Natural History Report: Geology,* Vol. 1, No. 1. British Museum (Natural History), London, 1914. 6s. 12½ x 9½.

The possible avenues by which floras have been distributed over the globe, not only in past geologic time but at the present day, have always been matters of extreme interest. From known facts of distribution it has long seemed that the vast Antarctic region must hold the key to much of this history. On this point Darwin wrote: "Nothing is more extraordinary in the history of the vegetable kingdom, as it seems to me, than the apparently very sudden or abrupt development of the higher plants. I have sometimes speculated whether they did not exist somewhere during long ago on an extremely isolated continent, perhaps near the South Pole." The recent revival of activity in Antarctic exploration has supplied data which in part at least confirms these conjectures. Thus, the Swedish expedition discovered an extensive Jurassic flora on Graham Land, and this suggests an avenue by which this widespread flora reached from Africa through Gondwana Land (Antarctica) to the South American continent. Professor Seward's report on the material secured by the Scott parties carries the presence of fossil plants very much farther south than ever before known. They are from five localities between the Priestley Glacier, 74° S., to Buckley Island, 85° S., the latter less than 350 miles from the Pole. The rocks in which the plant remains were found have been designated the Beacon Sandstone and extend from Mt. Nansen to at least as far south as 85°, or a distance of 700 miles; it has a maximum thickness of over 1,500 feet and is composed of fine-grained sandstones and shales with occasional coal seams and carbonaceous streaks. F. H. KNOWLTON.

MATHEMATICAL GEOGRAPHY

SURVEYING AND GEODESY

DAVIS, R. E., AND W. H. RAYNER. **Unusual Methods Simplify Topographic Survey of Rough Wooded Area.** Diagrs. *Engineering Rec.,* Vol. 73, 1916, No. 10, pp. 316-317. [Describes surveying a tract in Missouri on the scale of 1:600 with 2-ft. contours at a cost of $3.34 per acre.]

JOLY, J. **On a Method of Estimating Distances at Sea in Fog or Thick Weather.** Diagr. *Proc. of the Royal Soc.,* Series A, Vol. 92, 1916, No. 637, pp. 170-175.

SANDE BAKHUYZEN, H. G. VAN DE. **Comparison of the Dutch Platinum-Iridium Metre No. 27 with the International Metre M, as Derived from the Measurements by the Dutch Metre-Commission in 1879 and 1880, and a Preliminary Determination of the Length of the Measuring-Bar of the French Base-Apparatus in International Metres.** *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam,* Vol. 17, Part 1, pp. 311-318. Dec., 1914.

SANDE BAKHUYZEN, H. G. VAN DE, N. WILDEBOER, AND J. W. DIEPERINK. **Comparison of the Measuring Bar Used in the Base Measurement at Stroe with the Dutch Metre No. 27.** *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam,* Vol. 17, Part 1, pp. 300-311. Dec., 1914.

PHYSICAL GEOGRAPHY

GEOPHYSICS

DE SITTER, W. **On Isostasy, the Moments of Inertia, and the Compression of the Earth.** *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam,* Vol. 17, Part 2, pp. 1295-1322. June, 1915.

SWANN, W. F. G. **Atmospheric Electric Observations Aboard the "Carnegie," 1915.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 12, p. 611. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

WALKER, G. W. **A Portable Variometer for Magnetic Surveying.** Diagrs. *Proc. Royal Soc.,* Series A, No. 639, Vol. 92, 1916, pp. 313-321.

GEOLOGY AND GEOMORPHOLOGY

LAWSON, A. C. **The Epigene Profiles of the Desert.** Ills. *Bull. Dept. of Geol., Univ. of California,* Vol. 9, 1915, No. 3, pp. 23-48.

The alluvial fans, rock slopes, and flood erosion of dry regions are now sufficiently well known to warrant an attempt to treat them inductively. Professor Lawson makes this attempt in order to see whether it is possible to obtain new light upon the conclusions which have hitherto been derived deductively. In this he is successful. He discusses the processes by which weathering takes place and fans are built up at the base of mountain slopes. He speaks of the materials thus deposited as the "embankment"—a term which may be desirable but which to the reviewer constantly calls up a picture quite different from that intended by the author. A much better new term is "panfan," by which the author means the combined fans which together form the frontal apron of deposits at the base of a slope. In other publications he has used the term "fanglomerate" for the materials of such fans. These two terms are likely to be used permanently.

The chief new point in Professor Lawson's paper is the hypothesis that the comparatively smooth and gently sloping expanses of almost naked rock which are often found at the base of desert mountains are probably not due to sheet-flood erosion, as supposed by McGee. The recession of the base of a mountain by normal erosion is a process which goes on continually. Its details are here carefully explained. Erosion on the newly formed plain is soon checked by the deposition of fanglomerate, which covers it with a thin veneer. When the mountain is worn sufficiently low so that detritus is no longer brought from it to the fans, erosion may attack the veneer and carry it off, leaving a smooth plain of rock. This hypothesis seems at least as probable as that of sheet-flood erosion. As the effect of the climatic changes of the Glacial Period and later times is not considered, there are almost no places where the theoretical considerations here advanced can be adequately tested. It is probable, however, that some parts of southeastern California have always been dry enough so that they furnish approximately the desired conditions. It is possible that Professor Lawson's substitute for sheet-flood erosion might work more effectively if he would add to the present paper a consideration of what would happen during glacial and interglacial epochs and stages. During epochs of moist climate there may have been a stripping of fanglomerates, which would account for many of the broad rock benches without either sheet-flood erosion or the extreme degree of lowering of the mountain demanded by the hypothesis here suggested. ELLSWORTH HUNTINGTON.

CLARKE, F. W. **The Data of Geochemistry: Third Edition.** 821 pp. Index. *U. S. Geol. Surv. Bull. 616.* Washington, 1916. [A "critical summary of what is now known [of geochemistry] and a guide to the more important literature of the subject," revised and enlarged from the first (1908) edition, which appeared as *U. S. G. S. Bull. 330,* and the second (1911) edition, which appeared as *Bull. 491.*]

HOLMES, ARTHUR. **Radioactivity and the Measurement of Geological Time.** Diagr., bibliogr. *Proc. Geologists' Assoc.,* Vol. 26, 1915, Part 5, pp. 289-309. London. [Abstracted in the April *Review,* pp. 305-306.]

PHYTOGEOGRAPHY AND ZOÖGEOGRAPHY

BERRY, E. W. **Notes on the Ancestry of the Beech.** Maps. *Plant World,* Vol. 19, 1916, No. 3, pp. 68-77. [Abtracted in this number on pp. 378-379.]

—— **Leguminosæ, The Distribution of, and Past Geographical Changes.** *Geogr. Journ.,* Vol. 46, 1915, No. 5, p. 399.

RIGG, G. B. **Physical Conditions in Sphagnum Bogs.** *Botanical Gazette,* Vol. 61, 1916, No. 2, pp. 159-163. [A summary from H. J. Cox's bulletin on frost and temperature conditions in the cranberry marshes of Wisconsin (*Weather Bur. Bull. T,* 1910) of data bearing on the ecology of sphagnum bogs.]

HUMAN GEOGRAPHY

ANTHROPOGEOGRAPHY

BRIGHAM, A. P. **Problems of Geographic Influence.** *Annals Assoc. of Amer. Geogrs.,* Vol. 5, 1915, pp. 3-25. [Abstracted under the title of "Geographic Influences in the Field of Science" in the March *Review,* pp. 223-224.]

HUNTINGTON, ELLSWORTH. **A Neglected Factor in Race Development.** Diagr. *Journ. of Race Development,* Vol. 6, 1915-16, No. 2, pp. 167-184. [Influence of climatic changes: work of Matthew, Brückner, Pettersson drawn upon, as in Doctor Huntington's article in the March *Review* on "Climatic Variations and Economic Cycles."]

MAUNDER, E. W. **The Principles of World-Empire.** *Journ. of the Trans. of the Victoria Inst.,* Vol. 47, 1915, pp. 11-34. London.

TRÄDGÅRDH, IVAR. **Människans andel i insekthärjningars uppkomst: Några biologiskt-geografiska synpunkter.** *Ymer,* Vol. 35, 1915, No. 3, pp. 273-281. [Man's part in causing insect ravages.]

ECONOMIC GEOGRAPHY

LYON, T. L., E. O. FIPPIN, H. O. BUCKMAN. **Soils: Their Properties and Management.** (Series: Rural Text Books.) xxi and 764 pp. Maps, diagrs. The Macmillan Co., New York, 1915. $1.90. 8 x 5½.

In the preparation of the 1915 edition of the former work of the same title by Lyon and Fippin, the authors associated with them their colleague, H. O. Buckman. The result of this renewed effort is ample cause for congratulation since the book is without question one of the most complete works in English on the subject of soils. The subject-matter has been much revised and rearranged in the present edition, and a generous amplification in the treatment of some of the old material has increased the size of the book from 531 to 764 pages. The usual fundamental principles of soils science are given ample consideration, and the origin of soils, the geological relationships therewith, the composition and classification of soils, and the outstanding features of the physical properties of soils receive careful consideration in the first seven chapters. Half again as much space as in the former volume is then given to the important matter of organic matter in soils, which in turn is followed by a new chapter on the colloidal matter of soils. The next five chapters treat of soil structure and of the relations of plants and soils to those two important requisites to plant growth—moisture and heat. The next two chapters deal at much greater length than the corresponding ones in the former edition with the availability of plant nutrients in soils and the absorptive properties of the latter. A chapter on the subject of acid soils supplants the very brief statements on the subject in the earlier work, and that is followed by chapters on alkali salts and on some plant-physiological principles relating to absorption of nutritive salts by agricultural plants. The succeeding chapters treat of soil organisms, soil air, commercial fertilizers, soil amendments, fertilizer practice, farm manures, land drainage, tillage, irrigation and dry farming, and the soil survey.

Altogether the subject-matter is lucidly, though briefly discussed, and the student finds in the new work an excellent and helpful bibliography, which was missing in the first edition. The latter fact easily compensates for the deletion of many of the illustrations of the earlier volume. Most welcome of all is the clearly marked tendency of the authors to burst the shackles of conservatism which bind many of us so securely to the old and revered ''orthodoxy'' in soils science and to emerge into the atmosphere of ''modernist'' progress. It would have been better to carry this tendency still farther. The chapters on commercial fertilizers, farm manures, tillage, and the like might have been much more curtailed and those on plant-physiological principles, soil colloids, available plant nutrients, adsorption and absorption much more amplified. Despite all this, their colleagues owe a debt of gratitude to the authors for a comprehensive and very readable text on soils.

CHARLES B. LIPMAN.

TAUSSIG, F. W. **Principles of Economics.** 2nd edit., revised. Vol. I: xxxvii and 547 pp. Diagrs., bibliogr. Vol. II: xviii and 573 pp. Diagrs., index, bibliogr. The Macmillan Co., New York, 1915. $4. 8½ x 6.

This book, published originally in 1911 and reprinted seven times before the appearance of the present edition, has been warmly received by economists. Though widely used as a textbook for college students beginning the study of economics, it was not prepared primarily for this purpose. The writer's object in making the book was ''to state the principles of economics in such form that they shall be comprehensible to an educated and intelligent person who has not before made any systematic study of the subject.'' Professor Taussig's purpose has been well accomplished, and it can be truly said that his work presents in readable form the fundamental conclusions of modern economists and the lines of reasoning upon which such conclusions rest. It may, perhaps, be correctly designated an orthodox or theoretical treatment of the subject based upon wide observation and sound common sense. There are some economists of the present day who emphasize the importance of geographical factors (along with various other factors) in explanation, in part at least, of certain economic phenomema. There is little if any indication in Professor Taussig's book that such an idea should find expression in a treatise on the principles of economics. There is, however, in the chapter on the division of labor an interesting discussion of geographical division of labor, its causes and consequences. Again, in the discussion of the theory of international trade, the student of economic geography will find some material sufficiently related to his own particular field to furnish food for his serious thought. Nevertheless, it must be admitted that there are to be noted in Professor Taussig's volumes but few points of contact between the fields of economics and geography. The book may be warmly commended, however, to the serious attention of geographers not because of any contribution which it makes to the fund of geographical knowledge, but because of the broadening effect which it is bound to produce upon geographers from coming in close touch with a high-grade work in the social sciences where the main line of interest is mankind.

AVARD L. BISHOP.

THE
GEOGRAPHICAL REVIEW

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THE VOLCANIC HISTORY OF ETNA

By WALTER WOODBURN HYDE
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Etna is the chief landmark of the Mediterranean. Its location near the geographical center of that great inland sea, its huge bulk and commanding height, and its isolation, all render it the most conspicuous natural object of southern Europe. Whether we look up at it from the streets of Catania directly at its base or from a little distance along the shore, from Syracuse or Taormina, or whether we view it from far out at sea, we are struck no less with wonder in contemplating the length of time consumed in rearing such a mass from the original vent on the ocean's floor than with admiration for the beauty of its contour. The loveliness of the view of the volcano across the intervening vale of the Alcantara from the cliffs of Taormina, as its dark cone rises gracefully above the green of its lower slopes, makes us feel with Cardinal Newman a sort of awe arising within us

> That sinful man should see
> Glories far worthier seraph's eyes.[1]

This was the view which the veteran traveler, Sir Henry Holland, recalled in his old age as one of the three finest he had witnessed, comparing it with the peak of Teneriffe and the first sight of Damascus.[2]

It is no wonder that ancient navigators looked upon this lofty pyramid as the highest point of earth—nor were they so far wrong as they knew the world. For, if we except the Alpine chains, only at the extremities of the Mediterranean are higher mountains to be found.[3] And besides, from whatever one of Sicily's encircling seas they viewed it, they could see it for many miles. All this combined to make Etna famed from the earliest times.

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[1] Lyra Apostolica, "Tauromenium."

[2] Quoted by A. J. C. Hare: Cities of Southern Italy and Sicily, p. 399.

[3] Etna is 10,758 ft. high. The highest mountain in Spain is Mulhacén (11,421 ft.) in the Sierra Nevadas in the southeastern corner of the country: here is also the Picacho de Veleta (11,148 ft.). The loftiest peak in the Pyrenees is the Pic de Néthou in the Maladetta massif (11,168 ft.); the next highest there are the Posets (11,047 ft.) and Perdu (10,997 ft.). The main range of the Atlas Mountains in Morocco, the High Atlas, has many summits over 11,000 feet, the highest peak, Tiziren, being estimated at 15,000 feet. In Syria, at the other end of the Mediterranean, the highest peaks are in the Lebanon range; thus Jebel Kornet-es-Saudâ is 11,024 feet, and Jebel Tizmarun, 10,548 feet.

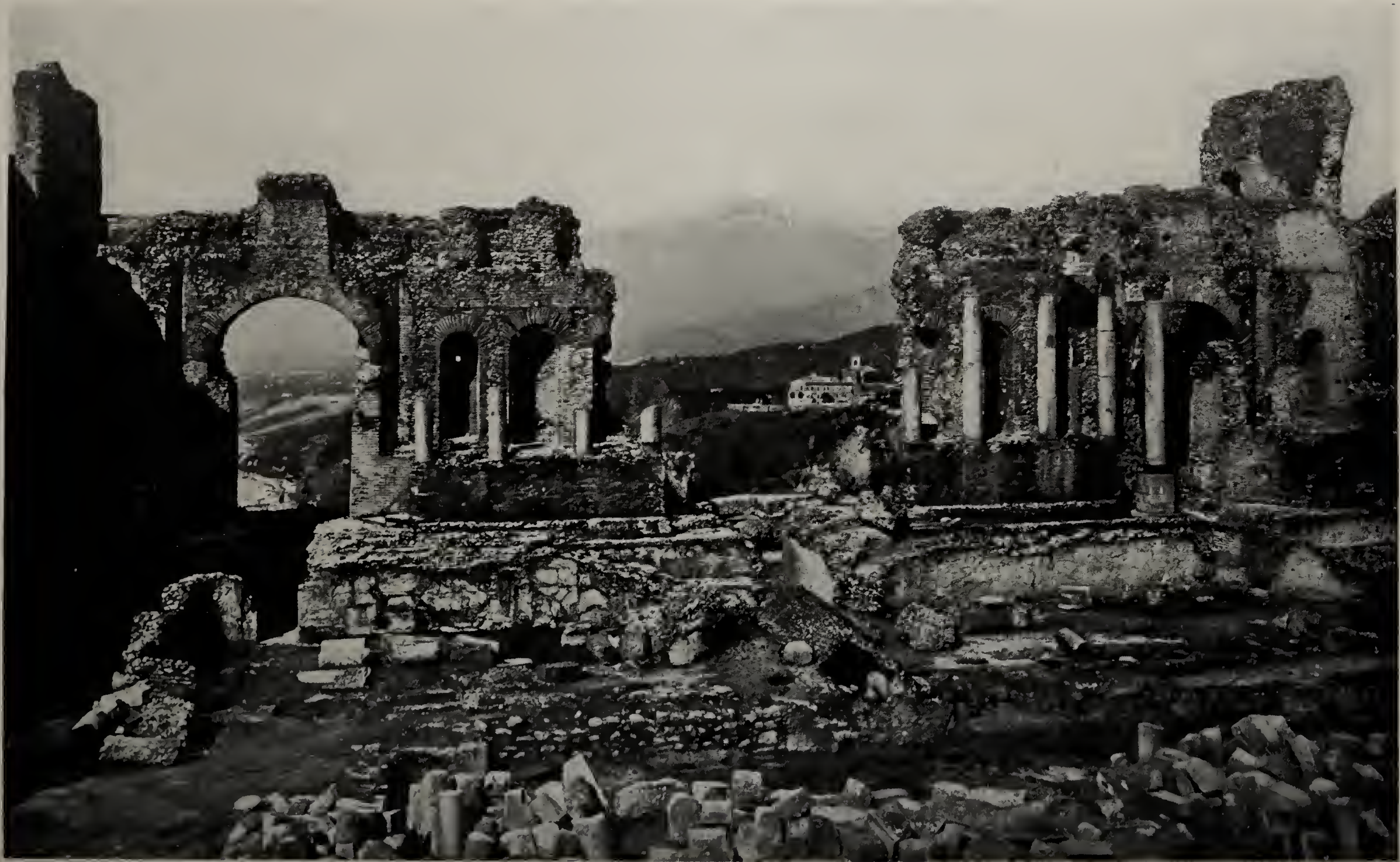

FIG. 1—View of Etna from the Greek theater of Taormina

As far back as the early fifth century B. C., it was called poetically the "pillar of heaven."[4] In the Middle Ages the Saracens named it simply "el Jebel," the mountain; and this practice is still kept up by the Sicilians, who call it either "il monte," or, combining the Italian and Arabic words, "monte Gibello" (Mongibello), the mountain of mountains, which it truly is.

The history of its volcanic activity, though but a tiny fraction of its past, is long and interesting. We have historical records of its eruptions extending back certainly for twenty-four centuries, if not earlier, and numbering well over a hundred. Many of these have lasted over a period of months and done incalculable damage to life and property.[5] There have also been long periods of rest; sometimes these have alternated with those of the neighboring Vesuvius and Stromboli, but more often they have been independent, so that no subterranean connection can be established as existing between them.[6] Nor can any regularity be traced in these outbreaks. Some have been preceded by long premonitory signs, while others have come on with great rapidity. Etna is apparently her own mistress, and her whims yield to no master.

The geological character of few other volcanoes has been so carefully studied. It has aroused in all ages not only the admiration of poets but the interest of scientific observers. Among the Romans many attempts were made to explain the mystery of Etna's fires, and in modern times the phenomena of the mountain have called forth a vast amount of inquiry and study. It will be our purpose here to trace very briefly this long history from the time of Hesiod, who in poetic fashion describes a prehistoric upheaval, down to the last eruption of consequence in the present century.

The convulsions of the volcano were explained by most of the Greek and Roman poets as the struggles of the rebellious giants Typhoëus (Typhon)[7] or Enceladus[8] imprisoned beneath the mountain by the thunderbolts of Zeus. Others saw in the mighty crater the smithy of Hephaestus (Vulcan), wherein the bolts of the king of gods and men were forged.[9] It is most curious that Homer, though he made the whole region of eastern Sicily the scene of some of the most stirring adventures of Odysseus, makes no direct allusion to the volcanic character of Etna. He pictures the blinded Cyclops as hurling rocks after the retreating ship of the hero,[10] which some commentators, to be sure, have referred to an eruption great enough to hurl rocks from the crater into the sea, or, perhaps, to the breaking of a lava stream over a cliff. In fact, since the days of Pliny, the rocks known as the "Scoglie dei Ciclopi" in the sea a few miles above Catania have been connected with this adventure. But the silence of Homer can be explained best by assuming that the mountain was quiescent in his age. Surely the poets of the Odyssey would not have missed the opportunity to describe so tremendous a natural phenomenon if it had been known to them. It is probable that the lines in the "Theogony" of Hesiod, which describe the fate of Typhoëus, refer to an outbreak of Etna known to the poet:

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[4] *Κίων δ'οὐρανία* (Pindar: Pyth. Od. 1, 36:)

[5] Sartorius von Waltershausen and A. von Lasaulx, in the atlas to their great work, "Der Aetna" (Leipsic, 1880), enumerate 105 eruptions as historically recorded over a period of twenty-six centuries, i.e. between 693 B. C. and 1879 A. D. If the eruptions of 1883, 1886, 1892, and 1910 are added, we would have a total of 109, or one for about every twenty-four years. In this article I have given reasons for placing the first historical eruption in 479 B. C. and not in 693 B. C.

[6] The ancients believed such a connection did exist. Thus Diodorus, v, 7, in speaking of the Aeolian (=Lipari) Islands, says that some maintain there are caverns under the earth running as far as Etna and so conclude there must be communication between them so that they eject flames by turns.

Pliny: Nat. Hist., iii, 14, tells an interesting story, how the people on Strongyle (=Stromboli) predict the winds three days beforehand from the smoke of their volcano and that this is the reason of the myth of Aeolus, the king of the winds; he says the Greeks call these seven (now eleven) islands the Hephaestiades, while the Romans call them the Vulcanian Isles.

[7] E. g. Pindar: Pyth. Od. 1, 31; cf. Ol. Od. 4, 1, and Strabo, xiii, 4, 6 and v, 4, 9 (in the latter passage the geographer says the poet placed Typhoëus under the whole area from Cumae to Sicily); Aeschylus: Prometheus, 354; Ovid: Metamorphoses, 5, 345 *seq.* (1, 353=" flammamque ferox vomit Typhoëus"; cf. Fasti, 4, 491=" Typhoïs Aetna"); Silius Italicus, xiv, 196; Nonnus: Dionysiaca, xiii, 318-320, and cf. 474 *seq.*: etc.

In the Iliad, ii, 783, we read:—"Among the Arimi, where they say is the bed of Typhoëus"; but the Arimi are a people of Syria and not yet localized in Sicily.

[8] E. g. Vergil: Aeneid, iii, 578: Oppianus (end of second century A. D.): Cynegetica, i, 273: Callimachus: Hymn. in Del., 141, places Briareus under Etna; Horace, Od., iii, 4, 73 *seq.*, mentions the fabled punishment but does not name the giant.

> When thus the god
> Had quell'd him, thunder smitten, mangled, prone
> He fell; the vast earth groaned beneath the shock.
> Flame from the lightning-stricken prodigy
> Flash'd, 'midst the mountain-hollows, rugged, dark,
> Where he fell smitten. Far and near, vast earth
> With that portentous vapour glow'd intense,
> And melted; . . .[11]

Pindar is the first Greek poet, however, who certainly describes an eruption of Etna. With a few masterly strokes he speaks of the "pillar of heaven, snowy Aetna, nursing the whole year's length her frozen snow" and continues:

"Whereout pure springs of unapproachable fire are vomited from the inmost depths; in the daytime the lava-streams pour forth a lurid rush of smoke, but in the darkness a red-rolling flame sweepeth rocks with uproar to the wide deep sea."[12] A reflex of Pindar's description and that of

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[9] E. g. Aeschylus: Prometheus, 366-367; cf. Euripides: Troades, 220; Vergil: Aen., viii, 42 (- "Vulcani domus"); Cicero: De divin., ii, 19; Valerius Flaccus: Argonautica, ii, 420; Solinus (second half of third century A. D.): Memorabilia, 11; etc. Lucilius: Aetna, denies this myth; Strabo, v, 4, 9, in speaking of the earthquakes which once drove the inhabitants from the islands of Pithecussae (=Ischia), says this is also the explanation of the story of Typhon imprisoned under Aetna.

[10] Od., ix, 481 *seq.*

[11] 856 *seq.* (Elton); the whole passage is 820-868. The fact that this description was imitated by Pindar and Aeschylus in referring to Aetna makes it probable that Hesiod had the volcano in mind; 1, 860 in the manuscripts (followed by the scholiast and by the Byzantine Greek commentator Tzetzes in his edition of Lycophron, v, 688) reads

οὔρεος ἐν βήσσῃσιν ἀϊδῆς παιπαλοέσσης

Here the word *ἀϊδῆς*—translated above as "dark"—is generally read by modern commentators as *Αἴτνης*, which would refer the passage unmistakably to the volcano; thus e. g. Schömann, in his edition of the "Theogonia," p. 244, footnote 2 (though he admits the entire verse is superfluous and probably interpolated). S. von Waltershausen, in his "Aetna," refers the eruption here described by Hesiod to 693 B.C.; he is followed by W. Christ: Der Aetna in der griech. Poesie (1888) and G. de Lorenzo: L'Etna (1907), pp. 26 and 30; the two latter contend also that Pindar and Aeschylus are describing this eruption and not the one of 479 B. C., as I have assumed below.

[12] Pyth. Od, 1, 36-38 and 40-46 (E. Myers). This ode was written in honor of Hiero's Delphic victory of 474 B.C. Hiero had removed the inhabitants of Catania to Leontini in 476 B. C., and repeopled the town

Hesiod already mentioned is found in a grand passage of the "Prometheus" of Aeschylus, in which the proud Titan thus answers the advice of Oceanus, who, with the warning example of what befell a brother giant, urges him to relent and give up his secret and be freed from the rock to which he is fettered:

Another have I seen
And mourned for, erst the Earth-born denizen
Of vast Cilician caves, that monster-foe,
Now forcibly subdued by power supreme,
Dread hundred-throated Typhon unappalled
That stood erect against the heavenly host,
Hissing red slaughter from his horrid jaws,
While living lightnings flashed from his eyes,
As he would storm of Zeus the sovran throne.
But the ne'er slumbering firebolt, neezing flame,
Zeus' javelin, descending on him there,
Down-smote him from his pinnacle of pride,
And scathed his strength to ashes. Who to-day,
Stricken to the core, lies by the narrow sea
A paralyzed and ineffectual bulk
Pressed beneath Aetna's rock root: where above,
Under the summit, at his forge unseen,
Hephaestus sits, hammering the massive ore.
There one day shall break forth rivers of fire,
Devouring with all-devastating jaws
Fair-fruited Sicily's smooth acreage;
Such turbulent wrath shall boil from Typhon's breast
Though burnt to cinders by Heaven's thunder-store.[13]

The earliest historical writer to mention an eruption of Etna is Thucydides. In the course of his history of the Peloponnesian War he records that there had been three eruptions of the volcano since the Greeks had settled in Sicily.[14] He says the first occurred in the spring of 425 B. C., when "a fire-flood issued from Aetna as on former occasions and destroyed

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with 5000 Syracusans and 5000 Peloponnesians and called it "Aetna"; he did this for a variety of reasons, but chiefly because he wished to be remembered as a founder of a city; so Pindar, 59-60, calls him κλεινὸς οἰκιστήρ—"glorious founder," and Αἴτνας βασιλεῖ—"King of Etna." (After Hiero's death in 467 B. C., the former Catanaeans returned in 461 and revived the old name; the inhabitants whom they then expelled established themselves in the town of Innesa, which they called Aetna; this is the Aetna of Strabo already mentioned). It is known that Pindar visited the court of Hiero in 474 B. C.; though indebted to Hesiod in his account, as Aeschylus was also, still he may have been describing an actual eruption of his day, perhaps the eruption of 479 and not that of 693 attributed to Hesiod by the authorities mentioned above.

[13] 351 *seq.* (Campbell): many expressions here hark back to Hesiod: e. g. l. 356, "hissing red slaughter from his horrid jaws," recalls *γλώσσῃσι δνοφερῇσι λελιχμότες* of the Theogony, l. 826. Aeschylus may have visited Sicily in 476 to see his "Aetnaeans" played on the occasion of the foundation of Aetna; in any case he was in Syracuse in 474 when his "Persians" was represented in the theater there.

Many later writers and poets have imitated this fine passage of Aeschylus: e. g. Lycurgus, 95: *τῆς Αἴτνης ῥύακος πυρὸς—τοῦτον δὲ ῥεῖν φασὶν ἐπὶ τὴν ἄλλην χώραν*; Vergil: Aen., iii, 571-582. Among modern poets I might mention Milton: Par. Lost, i, 232 *seq.*; Byron: Prophecy of Dante, Canto 3; Leopardi: La Ginestra. With the exception of Pindar the ancient poets generally were utilitarian in their admiration, dwelling on the damage done by the eruptions, while the moderns are mostly impressed with the sublimity of the spectacle.

[14] iii, 116.

the territory of Catania"; the preceding one took place fifty years before, which is doubtless the one described by Pindar and Aeschylus and mentioned in the "Marmor Parium"[15] as happening in 479 B. C. He makes no mention of the date of the third one. These are the earliest historical records of the volcano, which therefore do not antedate the fifth century B. C.[16] After 400 B. C. several eruptions are recorded in Graeco-Roman writers. Of these the chief ones are the following:[17] 396 B. C., when a great lava stream reached the sea on the northeastern base of the volcano;[18] 141,[19] 135,[20] 126,[21] 122,[22] in which Catania was destroyed and a tithe of her territory payable to Rome was remanded for a period of ten years; circa 50,[23]—perhaps just before Caesar crossed the Rubicon in 49 B. C.; 44,[24] mentioned by Vergil as one of the signs of the gods' displeasure at Caesar's untimely death. It is probable that the fine description of an eruption in the Aeneid should also be referred to this date. In this passage the poet gives an account of the usual order of an eruption, mentioning the detonations, clouds of smoke and cinders, the lightning flashes from the crater and the belching out of fire, red-hot stones, and torrents of lava:

> But Aetna with her voice of fear
> In weltering chaos thunders near.
> Now pitchy clouds she belches forth
> Of cinders red and vapors swarth,
> And from her caverns lifts on high
> Live balls of flame that lick the sky:
> Now with more dire convulsion flings
> Displaced rocks, her heart's rent strings,
> And lava torrents hurls to-day
> A burning gulf of fiery spray.[25]

There were also eruptions in 38[26] and 32 B. C.[27] Between the latter date

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[15] Frag. Hist. Gr., i, 551.

[16] The statement of Diodorus Siculus, v, 6, that the Sicani before the Trojan war period moved from the eastern to the western part of Sicily because of eruptions of Etna, is probably a mere supposition of Timaeus, whom he quotes, and has no historical value; Dionysius Halicarnassus, in a passage in Bk. 1, also says the Siculi of Magna Graecia took possession of the country vacated by these Sicanians.

[17] Cf. article "Aitne" in the Pauly-Wissowa "Realencyclopädie," Vol. 1, p. 1111 *seq.*

[18] Diodorus, xiv, 59; Orosius (author of the "Historiae contra Paganos," in seven books, chiefly compiled from Justin, the first attempt at a Christian universal history from Adam to 417 A. D.), ii, 18, 6.

[19] Julius Obsequens (flourished about 369 A. D., and author of "De Prodigiis," an account of portents and prodigies of Roman history from 190 to 11 B. C., in chronological order), 23.

[20] Obseq., 26; Oros., v, 6, 2.

[21] Obseq., 29; Oros., v, 10, 11.

[22] Oros., v, 13, 3.

[23] Petronius: Carm de bell. civ., 122-135, which begins:—

"iamque Aetna voratur
Ignibus insolitis et in aethera fulmina mittit."

[24] Georgics, i, 471-473. Servius, in commenting on this passage, quotes Livy: "ut dicit Livius tanta flamina ante mortem Caesaris Aetna defluxit, ut non tantum vicinae urbes, sed etiam Rhegina (=Reggio) civitas afflaretur."

[25] iii, 571 *seq.* (Conington): cf. also Aen., viii, 418 *seq.*: Favorinus (in Gellius, xvii, 10) criticises this description. We know from Suetonius' Life of the poet that he was often in Campania and Sicily, where he must have had opportunities to observe both Vesuvius and Etna.

Doubtless the highly colored account of an eruption which we read in Silius Italicus, xiv, 58-69, is largely indebted to this description of Vergil.

[26] Appian, v, 117.

[27] Dio Cassius, l (i. e. 50), 8.

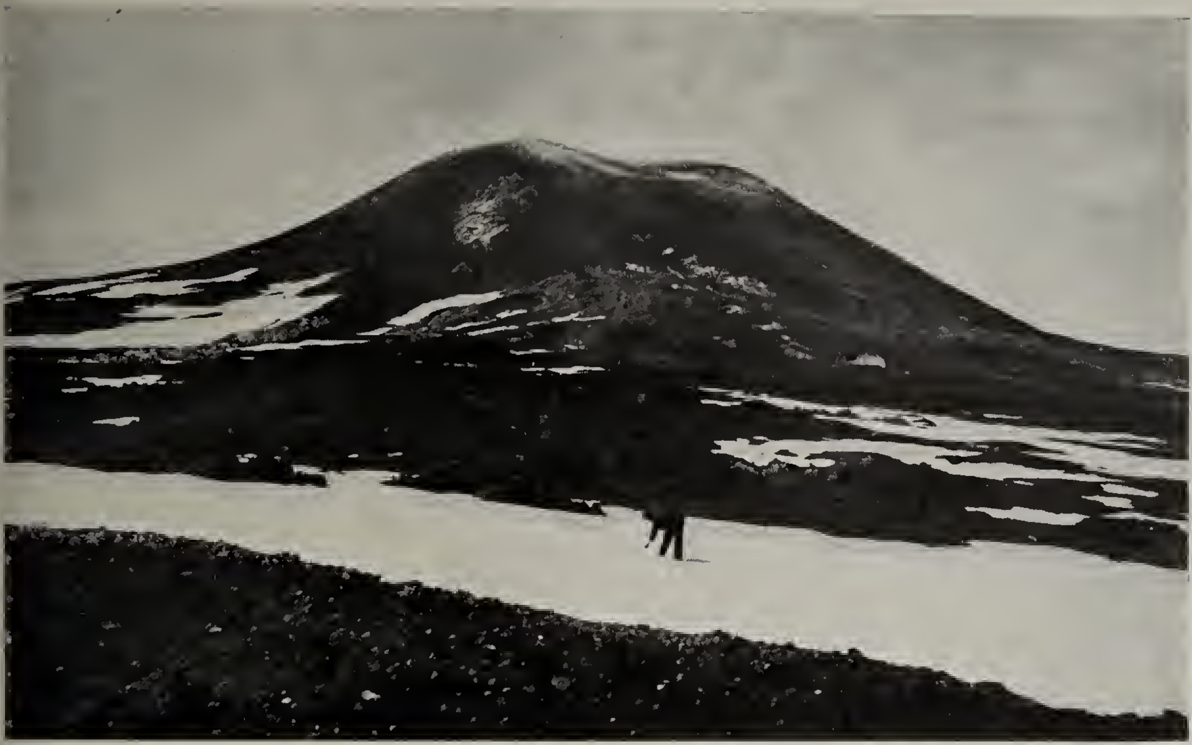

FIG. 2.

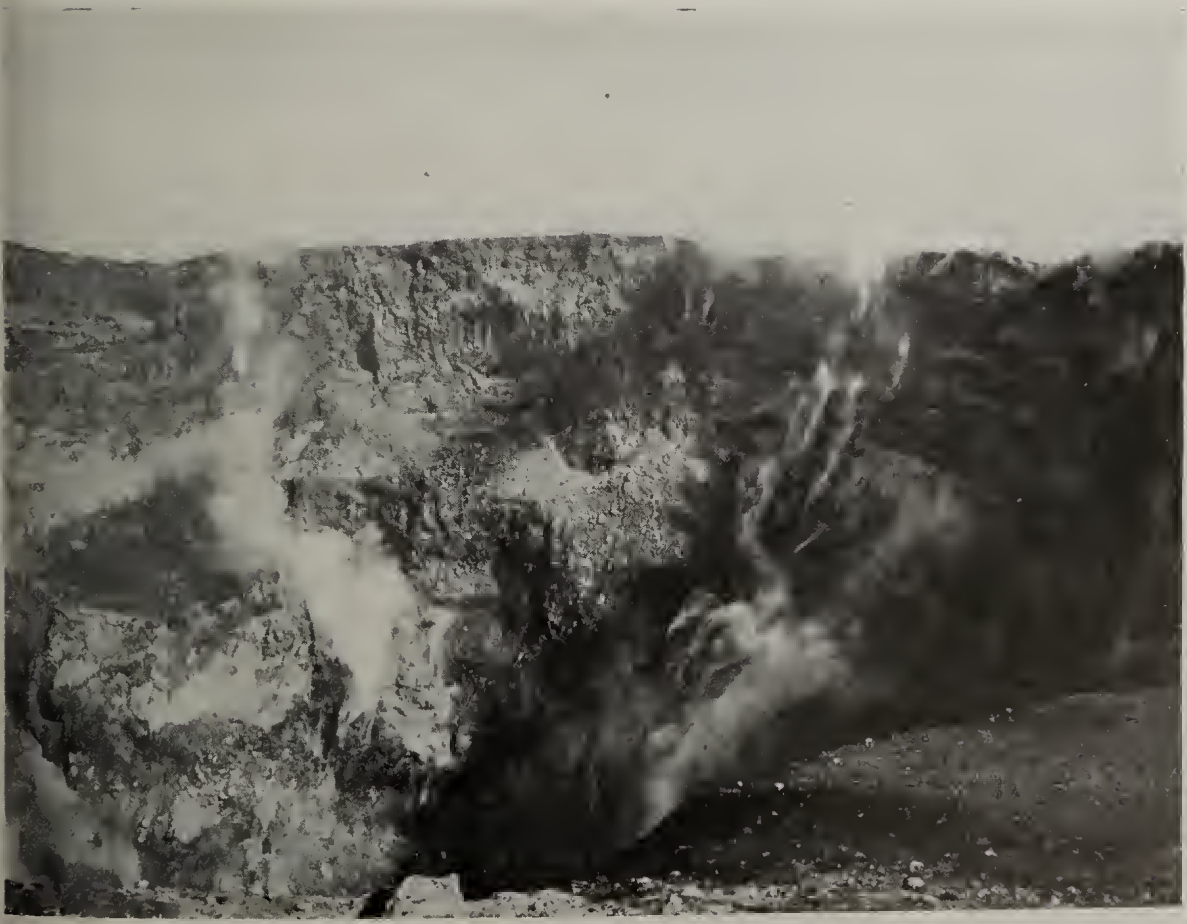

FIG. 3.

FIG. 2—View of the summit of Etna.

FIG. 3—View of the crater of Etna.

and 40 A. D., when an eruption occurred during the reign of Caligula, the volcano appears to have been quiescent. Thereafter no certain records occur for many centuries. In the time of Orosius—in the early part of the fifth century of our era—the mountain was at rest, and its former activity was remembered only because of its smoke.[28] His contemporary Claudian, the last of the classical poets, gives an account of an eruption in his poem "De Raptu Proserpinae," but it is full of exaggerations, as when he says one cannot visit the top of the mountain but must content himself with a view of it,[29] notwithstanding that we know from Strabo[30] and Seneca[31] that ascents were common centuries before.

Already in the first century B. C. the phenomena of the volcano had aroused the scientific interest of Roman writers. The great poet Lucretius (95-52 B. C.) was the first to renounce the poetical idea that Etna's eruptions were caused by the gods and to seek a scientific reason. The following lines are quoted from the "De Rerum Natura" from an eighteenth-century translation:

> And first Nature has formed the whole mountain hollow within, and supports these cavities by arches of stone. Now all the caverns are filled with wind and air; for air, when it is violently moved, becomes wind; and this wind, when it grows hot, and furiously whirling about, has inflamed the stone and the earth by beating upon them, and from them has struck out sparks of fire with rapid flame; then it raises itself up and throws itself violently out of the open jaws at the top, into the air; then it pours the fire abroad and spreads burning embers all about, and belches dusky clouds of rolling smoke and shoots out rocks of wondrous weight. This no doubt is done by furious blasts of wind within. Besides, the sea, for a great way, dashes its waves against the roots of this mountain and then sucks up its tide. The waters press into these caverns that lie directly under those open jaws above; this you must allow; and the flames, yielding to the driving flood, then force their passage out, and fly abroad and cast the fire on high, and throw out rocks and raise whole clouds of sand; for on the summits there are certain basons where wind is generated; the Greeks call them so; we call them mouths and jaws.[32]

Thus the eruptions are caused by the winds whose seeds are from the infinite universe; when they gather inside the mountain, they drive out the flames which lurk there in its bowels and force them out with its very stones: or else the wind, rushing through hollows at the foot of the mountain where the sea ebbs, blows out the flames above; while other winds are generated within the mountain itself. Whatever we think of this as a scientific explanation, we must admire the grandeur of Lucretius' description of the volcano's phenomena.

The poet Ovid (43 B. C.–18 A. D.) seems to have had an inkling of the "upheaval" theory of the origin of volcanoes. In speaking of the volcanic hill of Pittheus near Troezen in the Peloponnesus, he explains how a volcano is formed:

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[28] Oros., ii, 14.

[29] i, 158-176: he says

"Aetnaeos apices solo cognoscere visu
Non aditu tentare licet."

[30] vi, 2, 8.

[31] Epistle 79.

[32] vi, 680 *seq.*

> For—frightful to tell—the raging power of the winds, pent up in dark caverns, desiring to find some vent and having long struggled in vain to enjoy a freer air, as there was no opening in all their prison and it was not pervious to their blasts, swelled out the extended earth, just as the breath of the mouth is wont to inflate a bladder or the hide stripped from the two-horned goat. That swelling remained on the spot, and still preserves the appearance of a high hill, and has grown hard in length of time.[33]

The Augustan historian Justin has a theory about the wind and fire of Etna comparable to that of Lucretius:

> The soil itself (of Sicily), too, is light and frangible and so perforated with caverns and passages, that it is almost everywhere open to blasts of wind; and the very matter of it is naturally adapted for generating and nourishing fire, as it is said to be impregnated with sulphur and bitumen, a circumstance which is the cause that when air contends with fire in the subterranean parts, the earth frequently and in several places sends forth flame, or vapor or smoke. Hence it is that the fire of Mt. Aetna has lasted through so many ages.[34]

It is curious that the naturalist Pliny, who lost his life while observing the great eruption of Vesuvius in 79 A. D., did not turn his attention to an explanation of the phenomena of Etna. In one passage in his "Natural History" he remarks that the mountain is "wondrous for the flames emitted by night";[35] and after giving the circumference of the crater as twenty stades, he mentions the "red-hot cinders thrown as far as Tauromenium and Catania" and adds that the "noise is heard even at Maroneum and the Gemellian hills [=Madonia and the Monte di Mele]." But this is all that he says of the volcano. The philosopher Seneca, near the end of his life (65 A. D.), wrote a letter to his friend Lucilius, who was then procurator of Sicily, and asked him to make certain scientific investigations for him. After requesting him to examine the current of Charybdis and see what foundation there was for the stories told about it, he asked him to make the ascent of Etna and find out if there was truth in the report that the mountain was slowly diminishing in height, since it used to be visible to mariners for a greater distance.[36] He suggests that perhaps this report is based not on an actual dwindling of the summit, but because its inner fires have become weakened and do not blaze forth with their former violence, so that clouds of smoke are not now seen in the daytime; or, as he says (§2): "the mountain may be consumed by being daily devoured, and the fire not be so large as formerly, since it is not self-generated here, but is kindled in the distant bowels of the earth and there rages, being fed with continuous force; not with that of the mountain through which it makes its passage.'' However, it is quite possible that the cone had actually diminished in his day as it has done on several occasions in modern times. Thus Alessi[37] quotes Falcando as saying that the cone fell in 1179 and Fazello (or Fazelli)[38] that it was destroyed in 1329; he also records that it was engulfed in 1444 and that the whole top fell in during the great eruption of 1669. We know that the tableland, or *piano,* at the base of the present one is merely the result of truncation, which shows that this cone is recent. Its present size points to the fact that once a bigger one—rising perhaps five or six hundred meters higher[39]—stood upon it at some former time, perhaps prehistorically. As the present cone is composed of both cinders and tufa, it has undergone many changes in the past.

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[33] Metamorphoses, xv, 299 *seq.* (Riley).

[34] Historiae Philippicae, iv, 1 (Watson).

[35] iii, 14: cf. ii, 110.

[36] Epistle 79, §2:—"quam consumi et sensim subsidere ex hoc colligunt quidam, quod aliquanto longius navigantibus solebat ostendi." Cf. Aelian: Var. Hist., viii, 11, for a similar notion: *τῶν ὀρῶν τὰ ὑψηλότατα ἀκούομεν μειούμενα· τὴν γοῦν Αἴτνην φασὶν οἱ πλέοντες ἐξ ἐλάττονος ὁρᾶν ἢ πρὸ του ἐβλέπετο.*

Seneca in the same letter (§3) also asks Lucilius to describe Etna in verse, as Vergil, Ovid, and Cornelius Severus had already done. In §5 he says: ''It is a subject, moreover, so happily copious that they who have gone before seem by no means to have expanded it, but to have opened matter for further explanation.'' And so he requests him at least to introduce the hackneyed theme as an episode in some contemplated poem, if he does not wish to make it the subject of separate treatment. Now, a didactic poem entitled ''Aetna,'' in 644 hexameters, has come down to us, and though it has been ascribed variously to Vergil, Severus (the Augustan epic poet), Manilius, and others, it seems, because of its length and importance, to be the very poem which Seneca invited Lucilius to write.[40]

This poem, though it suffers from the unpoetic character of the subject and grave faults of style, is the most detailed and scientific description of any phase of nature which has come down to us from antiquity.[41] The author essays to give a scientific account of the phenomena of the volcano, scouting the poetic notion that (verses 29-73) Etna can be the home of a god or that Vulcan can have his forge there or the Cyclopes their workshop or that it can have aught to do with any of the Titans. He describes a former eruption (198-206): "A cloud of ignited sand is driven out in a whirl; burning masses hurry up, the substructures are rolled from the bottom; at one moment a crash bursts from every part of Aetna, at another wan flames mingle with black falling débris . . . . . but meanwhile the whole ground outside is strewn with a crowd of rocks and loose sands."[42] The agents in all this are wind and air—or more exactly spirit (*spiritus,* v. 212), which is the name of air in its tense forms, for without it fire is helpless. Inquiring (218-221) whence this wind comes to feed the flame and why its fury sometimes subsides, he says (300-304) that the particles of air and spirit jostle one another inside the mountain and, in the struggle to escape crowding, drag with them everything that stands in the way. Periods of quiescence prove that the winds which cause explosions come from within and not from without (328-356). Wherever an obstruction, such as a mass of rocks, occurs in the channels through which the spirit passes, then the volcano is quiet (373-375); but such delays only increase the subsequent outbursts (378-383), and thus we have desolating streams of lava, when all the inflammable substances in Etna—sulphur, bitumen, alum—burn (385-391). The special property of lava stone, or *molaris*—the chief component of the mountain—is to conserve fire with great tenacity,[43] this being unlike other substances, which, if once burned, cannot be rekindled (398-423); though the volcano's sides are covered with it, that which is within is more potent (449-459). He next gives the premonitory signs of an eruption, the crackling of the ground, the low murmur from the mountain's depths and the flame (460-462); these are followed by the eruption itself, when masses of burning rocks are heaved into the air and shoals of black sand are driven up to the stars and take on curious shapes (465-473). These ejected stones are dirty, rugged, and melting and pour down the slopes in a fiery flood—sometimes for twelve Roman miles; nothing can stop their course, everything is absorbed and consumed by these lava streams (474-489). But by degrees they cool and harden, and if they strike an object, sparks are thrown off (496-504). In short the scientific explanation of an eruption is this (565-566): the earth draws in forces through the holes which pierce it; spirit presses these into a confined space, and then the fire works itself a passage through rocks of the largest size.

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[37] Storia Critica dell' Eruzione dell' Etna, p. 149.

[38] Author of "Histoire de Sicile" (1574).

[39] Cf. Nouveau Dictionnaire de Géographie Universelle, Vol. 2, p. 224 (Paris, 1884).

[40] The proposed date of the "Aetna" ranges over a hundred years, from 44 B. C. to 79 A. D.—the latter the date of the eruption of Vesuvius, the greatest exhibition of volcanic forces recorded in antiquity and a spectacle which would not have been passed over in silence in such a poem. The earliest notice of such a work is found in Suetonius' "Life of Vergil," and so the "Aetna" was at first ascribed to that poet, as in the oldest manuscripts of it (dating from the tenth century) in the University Library at Cambridge. Recently a Hungarian scholar, Kruczkiewicz, in "Poema de Aetna Monte" (1882) has revived this older Vergilian authorship on the ground that certain works of art known then to have existed in Rome are referred to in the poem as away from the city; on the same argumentation Alzinger: Studia in Aetnam collata (1895) thought the poem was pre-Augustan; Scaliger, in 1572, because of Seneca's statement, referred it to Cornelius Severus, who is known to have composed a "Bellum Siculum." Barth referred it to Manilius, while Wernsdorf, in his "Poetae Latini Minores" (1785), Vol. IV, was the first to attribute it to Lucilius; he was followed by Jakob, in his edition of 1826, and this theory has been followed in recent years by H. A. J. Munro: Aetna (Cambridge, 1867) and Ellis: Aetna (Oxford, 1901) and is the prevailing view now. For the authorship of Lucilius it may be said that, apart from the evidence of Seneca's letter, the author shows an acquaintance with the philosopher's "Quaestiones naturales," written in A. D. 62-65 (according to Teuffel), a work which was addressed to him; that Lucilius was Seneca's friend and knew the locality and wrote a book on Sicilian subjects. So the best date for the "Aetna" lies between 65 and 79 A. D.

For a full account of the date, authorship, and analysis of the "Aetna" see the edition of Ellis: Prolegomena, pp. xxi-ciii, and his article in *Journal of Philology,* Vol. 16, p. 292 *seq.*

[41] It displays a knowledge of Lucretius, the pseudo-Aristotelian treatise "De Mundo" (referred to the first century B. C. by Zeller), Posidonius of Apamea, and Seneca. It mentions the small cone in the center of the crater (v. 182-"penitusque os erigit ultra") which Strabo describes, as also the cloud rising from it (vv. 333-335).

Toward the end of the poem (567-601) the author says men travel over

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[42] The translations are by Ellis, *op. cit.*

[43] vv. 398-399:—

"Sed maxima causa molaris
Illius incendi lapis est, is vindicat Aetnam."

Because of this fact Pliny: Nat. Hist., xxxvi, 137, says it was called *πυρίτης* (pyrites)=firestone:—"molarem quidem pyriten vocant, quoniam sit plurimus ignis illic." This "molaris" (*μυλίας*) was used for millstones. Theophrastus: Frag. de lapidibus, 22 (ed. Wimmer) says the color of Aetna's lava stone was black; Posidonius (*apud* Strabo, p. 269) says the same thing.

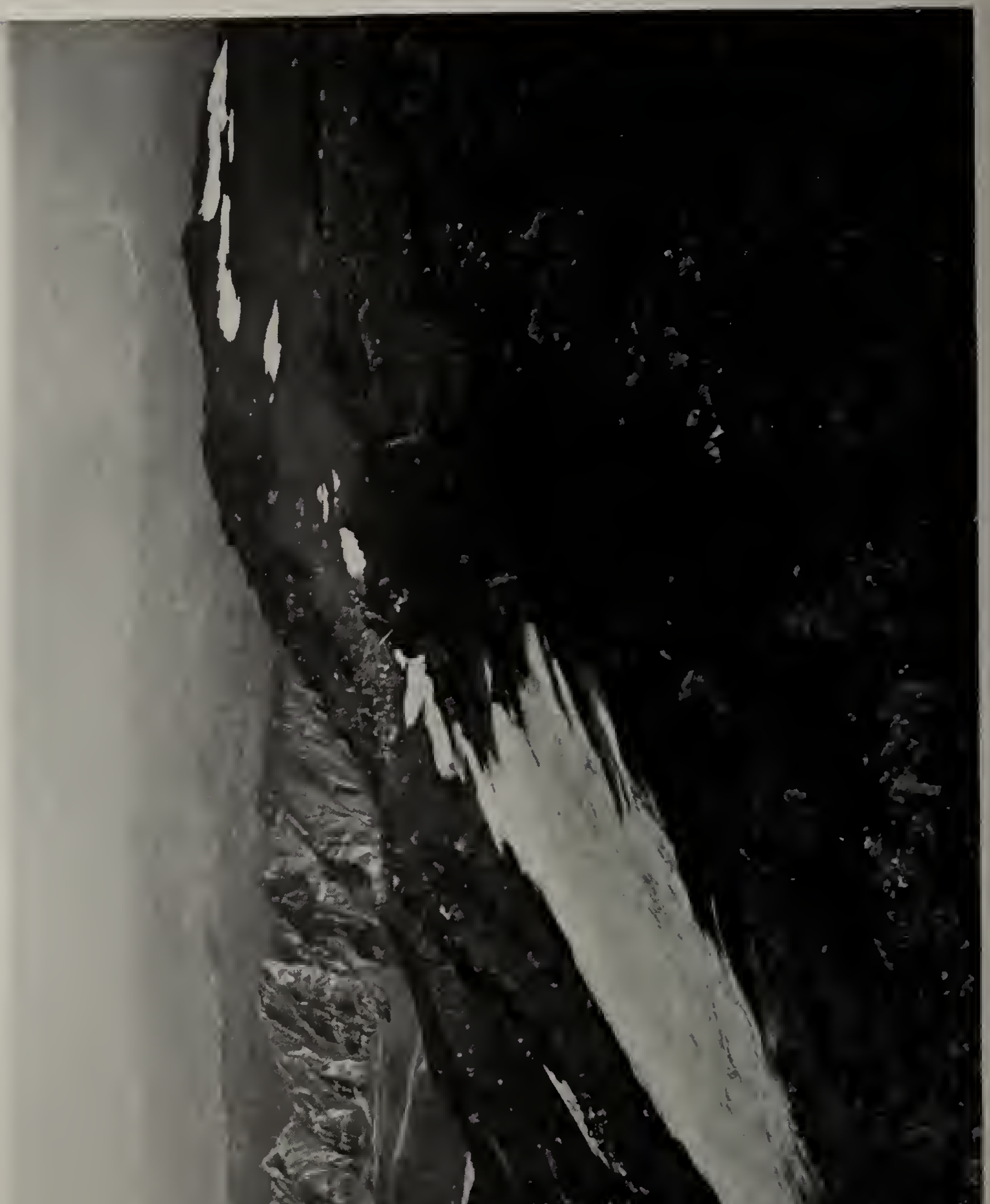

FIG. 4—The Valle del Bove, the huge fissure near the top on the eastern side of the volcano.

land and sea to visit famous temples and shrines and historic cities to see their works of art, but that none of these sights can rival the stupendous manifestations of the supreme artificer Nature; and nowhere in the crowded world of men can you see a sight so marvelous as here at Etna. He then describes a recent eruption—perhaps that of 40 A. D., in which Catania was destroyed—and says that the mountain, notwithstanding it has a series of crimes behind it, has one pious memory which atones for its guilt (602 *seq.*); for during an eruption, when everyone was selfishly striving to save himself, two brothers of Catania, seeing that their parents could not escape because of their infirmities, lifted them upon their backs and resolutely confronted the flames. The fire gave way on every side and they were saved.[44]

As already stated we hear little of the volcano in Roman literature after the time of Lucilius. Not until the twelfth century do the records of eruptions become common again. The most destructive since that date have been those of 1169, when a large portion of Catania was destroyed, including the cathedral with its bishop and congregation; 1185, when 15,000 people are said to have perished; 1665, when lava fell from the central crater to such an extent that it has been computed at 92,000,000 cubic meters;[45] 1669—perhaps the worst eruption recorded in the history of the mountain, when forty towns were wholly or partially destroyed with a population variously given as from twenty to sixty thousand, and when lava was belched forth in quantities reckoned at 980,000,000 cubic meters;[46] 1693, accompanied by an earthquake which nearly destroyed Catania; 1755, the year of the Lisbon earthquake; 1792, described scientifically by Ferrara.[47]

In the nineteenth century nineteen eruptions were recorded, an average of one for nearly every five years. The worst of these occurred as follows: in 1812, lasting six months; 1819, lasting two months and described by an eyewitness, Gemellaro of Catania;[48] 1832, when the village of Bronte on the northeastern side of the mountain narrowly escaped destruction; 1852-53, extending over a period of ten months, when the mountain cast forth a volume of lava computed at 420,000,000 cubic meters;[49] 1865, the best written-up account of an eruption in the history of the volcano,[50] during which the town of La Macchia above Giarre on the northeastern base was destroyed by earthquake; 1879, lasting from May 26 to June 6, during which time a new crater, now known as Monte Umberta Margherita, 4,705 feet above the sea, was formed on the northern slope, from which lava, having a superficial area of about 2,720,000 square yards, poured down almost to the Alcantara; 1892, when a crater opened near Monte Gemellaro and a lava stream flowed southward with an initial velocity of 380-540 feet per hour, which reached within one and a quarter miles of Borelli and two and one-half of Nicolosi. A dangerous eruption also occurred in 1910.

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[44] The same legend of the pious brothers is told by many other writers: e.g. in the De Mundo, vi, 33; Strabo: vi, 2, 3: Conon: Narrat., 43; Silius Italicus, xiv, 197; Seneca: De Beneficiis, ii. 37 and vi, 36; Claudian: De Rapt. Pros., xvii, 35.

[45] Thus in von Waltershausen: Der Aetna, Vol. II, p. 393.

[46] See Der Aetna; in the same passage the authors speak of a prehistoric eruption when lava fell computed at over a billion cubic meters. The eruption of 1669 should be compared with that of Krakatoa (a little island in the Sunda straits between Sumatra and Java), which occurred in August, 1883, when 30,000 to 40,000 people were drowned in a tidal wave. This has been called "the most violent and destructive event of the kind in history."

[47] See his "Storia Generale dell' Etna" (Catania, 1793) and "Descrizione dell' Etna" (Palermo, 1818).

[48] He states that five openings were made on the sides of the central cone, from which flames, red-hot lapilli, and sand were ejected; streams of lava combined with fire flowed down into the Valle del Bove and on through it to the head of the valley of Catania, where it poured, a hardened mass, over a cliff to the bottom with a deafening roar.

[49] Cf. Der Aetna, *loc. cit.*

In order to convey an idea of what an eruption of Etna is like, a brief description will be given of that of 1669, the most stupendous in the history of the volcano; and in conclusion the volcanic activity of the mountain in the last few years will be reviewed.

The eruption, beginning at the end of April, 1669, was the first to be carefully studied on the spot by a scientific observer, the naturalist Borelli.[51] It was accompanied by remarkable phenomena. Every house in Nicolosi was destroyed by an earthquake, and the fields above the town were converted into a fiery lake of lava which enveloped a part of the hill of "Monpilieri," which stopped the stream for a time; but it soon divided into three branches, the chief of which finally reached Catania—one of the longest on record.[52] Its rate of speed was variable; in some places it flowed as fast as fifteen hundred feet per hour, whereas in others it made only a few yards in days. Thus it is said to have run the first thirteen miles in twenty days, or an average of about 162 feet per hour, while it took twenty-three days for the last two miles, or twenty-two feet per hour. It took eight years to cool.[53] Where it approached the sea the stream was six hundred yards in breadth[54] and forty feet in depth and contained some 3,532,000,000 cubic feet.[55] When this gigantic river of molten matter reached Catania, it flowed over the sixty-foot city wall in a fiery cascade and destroyed a large section of the town. The inhabitants forthwith brought out the veil of St. Agatha, and the stream was deflected to the southeastern part of the city and flowed into the sea, forming a huge promontory which has acted ever since as a breakwater against storms and formed the only real harbor Catania ever has had.

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[50] See Elisée Reclus: La Sicile et l'éruption de l'Etna en 1865, *Le Tour du Monde*, Vol. 13, 1866, pp. 353-416; M. F. Fouqué: Rapport sur l'éruption de l'Etna en 1865, *Archives des Missions Scientifiques et Littéraires*, 2nd Ser., Vol. 2, 1865, pp. 321-357; and Rapport sur les phénomenes chimiques de l'éruption de l'Etna en 1865, *ibid.*, Vol. 3, 1866, pp. 165-246.

[51] Borelli (1608-1679) published his "Meteorologia Aetnea" in 1669. This eruption is also described in detail by Ferrara, *op. cit.*, and briefly by Lyell: Principles of Geology (11th edition, 1873-74), Vol. 1, pp. 21-23, and Reclus, *op. cit. infra*, p. 312. The Earl of Winchelsea, British ambassador at the Porte, visited Catania on his way home to England at the very time of the catastrophe and published his account in 1669 (London): a portion of this work is quoted by Sir Wm. Hamilton: Observations on Mt. Vesuvius, Mt. Etna, and other Volcanoes (Series of Letters addressed to the Royal Society, London, 1772), p. 60 *seq.* Among other things the Earl states that in forty days the habitations of 27,000 people were ruined and that out of 20,000 inhabitants of Catania only 3,000 were left!

[52] The Earl of Winchelsea gives its dimensions as fifteen miles long and seven broad.

[53] Some lava streams have taken even longer; thus Hoffman—quoted by Geikie: Text Book of Geology (3rd ed., 1893), p. 228—states that steam was still rising in 1830 from lava which dated from 1787.

[54] The Earl of Winchelsea says it was a mile in breadth and extended into the harbor for 600 feet.

[55] Elisée Reclus: The Earth and Its Inhabitants: Europe, Vol. 1, p. 312 (New York, 1882); this is 130,814,444 cubic yards.

During this eruption two apertures appeared a little west of Nicolosi, and sand and scoriae were gradually thrown up to such an extent that within three or four months the twin cones called "Monti Rossi," or red mountains, were raised some 450 feet above the side of Etna. A fissure six feet wide and of unknown depth stretched from the plain of San Leo for a distance of twelve miles to within one mile of the summit; its sides were covered with incandescent lava. A little later five parallel rents appeared and gave forth a noise that could be heard for forty miles.

The English traveler Brydone tells a very curious story of this eruption. A stream of lava encountered a vineyard which had been planted over an ancient bed; soon the crevices were filled up with the liquid, until the vineyard gradually began to move bodily, and it was carried on the surface of the stream for some distance, and though it was for the most part destroyed, a portion of it was still in existence in 1770 when Brydone saw it.[56]

Between 1883 and 1910 the volcano has shown a great deal of activity. Every eruption without exception has occurred on the southern slopes. In 1883, preceded and accompanied by earthquakes, a radical fissure running north and south opened from the central crater, though it proved abortive. In 1886 along this same fissure an eruption took place which lasted nearly three weeks. On May 18 of that year dense clouds of steam and ashes rose from the central crater; the next morning an earthquake occurred on the southern slope and a new crater, now known as Monte Gemellaro (4,650 feet above the sea), was formed northeast of Monte Concilio, four and a half miles above Nicolosi, from which steam, ashes, and molten stone came with loud detonations. From the southern base of this crater lava flowed for seventeen days in the direction of Nicolosi at the rate of 160 to 190 feet per hour. The inhabitants of the village carried the pictures of their three patron saints from the church to the "Altarelli," the open chapel which stands on an eminence a mile above the town. But as the lava continued to advance, the bishop of Catania on the evening of the twenty-fourth brought up the veil of St. Agatha. Three days later the lava had reached the "Altarelli" but had then divided and stopped, for it had expended its force. Still another stream flowed along the eastern side of Monti Rossi, headed for Nicolosi, but stopped on June 3 within 370 yards of it. The following day the eruption ended with an earthquake. A thousand acres of fertile soil had been desolated by the heated lava and turned into a hell.[57]

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[56] A Tour through Sicily and Malta (Series of letters to Wm. Beckford, Esq., 1773), ed. of 1806, p. 95; Borelli tells the same story more scientifically and dates the occurrence April 4, 1669; Sir William Hamilton, p. 85, also mentions having seen the vineyard; he says it was moved a half mile with little damage to the vines. Perhaps such a phenomenon was intended by Lucilius: Aetna, 488, who speaks of the forest and cliffs swimming:—

"Nunc silvae rupesque natant, hic terra solumque."

In 1892 another eruption took place in the old fissure of 1883. Four large craters were formed besides several smaller ones, and the activity of the mountain continued for six months.

Again on July 19, 1899,—six weeks after the writer's visit to the summit—an explosion, accompanied by slight earthquake shocks, took place in the central crater, and a gigantic pine-shaped cloud of steam and ashes rose to a height of 5,000 meters[58] over the summit and deposited a layer of ashes on the southeastern slope as far as the village of Zafferana. A "red rain"—the water being stained by the acid in the ashes—fell upon the summit, though little damage was done below.[59]

In the spring of 1906 Vesuvius began an intense activity, and the villages of Somma, Ottajano, and Giuseppe were threatened; houses in Bosco Trecase and Bosco Reale were destroyed by a lava stream and the streets of Naples were covered with ashes. Two years later, in April, 1908, an eruption occurred on the southern slope of the Valle del Bove on Etna lasting under twenty-four hours; earthquakes took place, but no new craters were formed and but little lava appeared. It was on December 21 of this year that the earthquake occurred which destroyed the two cities of Messina and Reggio on opposite sides of the strait which separates Sicily from Italy. According to the official record of the Italian government there were 96,871 deaths. At the same time both Stromboli and Etna showed signs of trouble but kept fairly quiet.

In the spring of 1910 Etna again became active.[60] In the early morning of March 23 slight earthquake shocks and detonations occurred which caused but little anxiety. At 8.15 A. M. above the Piano del Lago a thin column of steam, of the usual pine-tree shape, appeared. A large fissure, over that of 1883, extended from Monte Castello for two kilometers to the western base of the Montagnuola, on which many craters—over twenty in number during the next few days—formed, which emitted lava, incandescent lapilli, and "bombs," together with clouds of steam and dust. Most of the inhabitants of the villages on the slopes of the mountain still had a lively remembrance of what had happened in 1886 and 1892, and so every town, even Catania, was thrown into fear. The military was pressed into service to help the peasants to transport their belongings to safe distances. Processions, headed by priests bearing sacred relics, were everywhere visible.

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[57] Lava often reaches 2,000° Fahrenheit.

[58] Whymper: Travels Among the Great Andes of the Equator (1892), records that a cloud of volcanic dust rose 28,000 feet over the summit of Cotopaxi. Geikie, *op. cit.*, p. 194, says that steam constitutes 999/1000th of the cloud that hangs over a volcano; Fouqué, in his "Santorin et ses éruptions" (Paris. 1879) calculates that during 100 days one of the parasitic cones of Etna ejected enough vapor to form, if condensed, 21,000,000 cubic meters, which is 462,000,000 gallons, of water.

As for solid matter hurled from the top of Etna, stones are known to have reached 6,000 feet above the summit, and thirteen-ounce stones have been found fifteen miles away from it. In 1669 a stone containing fifty cubic feet was cast from the crater and landed a mile away; at the same time ashes fell upon the island of Malta, 125 miles away.

[59] See account of this eruption in *Nature*, Vol. 61, 1899, Dec. 21, p. 185.

[60] This account is taken from a contemporary magazine description and from that of Signor A Ricco—the director of the Etna Observatory—in *Nature*, Vol. 83, 1910, June 2, pp. 399-400; cf. also reports i the same volume, March 31, pp. 135-136, and April 17, p. 165. At the beginning of his article on p. 399 Ricc gives a brief summary of conditions on the mountain since the fissure of 1883 appeared.

By the 24th conditions became worse. First a stream of lava from the highest point of the fissure, near the Observatory, belched forth, forming a river 1,500 feet wide, which flowed at the rate of sixty or more feet per hour for a distance of two kilometers; it has been computed that it contained 20,000,000 cubic meters of lava. Later lava flowed mostly from the lower craters (from Volta di Girolamo, about 7,000 feet up the mountain) and formed a river of molten rock one hundred and fifty feet wide, which descended southward until it reached the eastern side of Monte Faggi, two kilometers below, and formed a magnificent cascade thirty-five feet wide and seventy high. As it passed southwest, it skirted Monte Sona on the east and then descended southward through the gorge between Monte San Leo and Monte Rinazzi, slowly diminishing in speed. In some places this river was from one hundred meters to a half kilometer in width and one kilometer in depth.

On top of Monte Castellazzo stands the ''Casa Cantoniera''; here scientists and observers had taken their station; but soon the base of the hill was almost surrounded by lava, which in places rushed down thirty feet a minute, and so they had to leave in haste. By March 25 the eruption grew more violent; five new craters were formed and the lava stream grew larger though it moved more slowly. By the 27th it had diminished and ceased to flow, but the next day it began again. Just below the ''Casa Cantoniera'' the lava flowed over a portion of the stream of 1763, and then slowly pushed around Monte Palombaro and divided into three arms; one moved toward Monte San Leo near by; the second toward Monti Rossi and Nicolosi and the third—already described as passing down along Monte Rinazzi—by the end of the month was running at the rate of 120 feet per hour toward Cisterna Regina and the village of Borello. Here hundreds of military wagons had assembled to rescue people and their goods. The easternmost lava stream had surrounded the ''Casa del Bosco'' on Monte Rinazzi; the other two joined and drove on at the rate of fifteen feet per minute toward Monte Nocilla and the village of Nicolosi. By the 31st the streams had reached Borello and Belpasso and one-half a mile nearer Nicolosi; they had destroyed great quantities of gardens, vineyards, and woodlands near these villages.

All this time Professor Ricco was in the Observatory; he had to leave on April 2; but by April 4 the eruption had decreased, only to start up anew the following day. The town of Cavaliere was covered with ashes; the fertile region of Cisterna Regina was utterly destroyed. Down in Catania processions were formed carrying the veil of St. Agatha from the

Cathedral to the church of Santa Maria through showers of ashes. The stream that was moving on Borello finally stopped less than a mile away; the eastern one, moving on Nicolosi, stopped near where the lava of 1886 had reached. By April 6 the lava from the lower craters reached the farthest point below—a distance of ten kilometers, while the higher streams continued to flow until the 20th. Thus the eruption of 1910 lasted over a period of twenty-nine days. But the detonations did not cease for several weeks. It is said that the peasants even yet can boil water over the lava in places. Decades must pass before the ground can be planted again—one more repetition of what has been going on for ages past in the evolution of Etna.[61]

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[61] Besides the various works on Etna mentioned in the foregoing pages, the following books should b noted: G. F. Rodwell: Etna, A History of the Mountain and Its Eruptions (London, 1878); O. Silvestri Professor and former President of the Club Alpino Italiano in Catania: Un Viaggio all' Etna (Rome, 1879 E. Chaix: Carta vulcanologica e topographica dell' Etna, 1:100,000 (Geneva, 1892), indicating all the lav streams down to 1892.

THE COUNTRY OF THE SHEPHERDS*

By ISAIAH BOWMAN

The lofty mountain zones of Peru, the high bordering valleys, and the belts of rolling plateau between are occupied by a race of shepherds. In that cold, inhospitable region at the top of the country are the highest permanent habitations in the world (17,100 feet), the loftiest pastures, the greatest degree of adaptation to combined altitude and frost. It is here only a step from Greenland to Arcady. Nevertheless it is Greenland that has the people. Why do they shun Arcady? To the traveler from the highlands the fertile valleys between 5,000 and 8,000 feet seem like the abode of friendly spirits to whose charm the highland dweller must yield. Every pack-train from valley to highland carries luxury in the form of fruit, coca, cacao, and sugar. One would think that every importation of valley products would be followed by a wave of migration from highland to valley. On the contrary the highland people have clung to their lofty pastures for unnumbered centuries. Until the Conquest the last outposts of the Incas toward the east were the grassy ridges that terminate a few thousand feet below the timber line.

In this natural grouping of the people where does choice or blind prejudice or instinct leave off? Where does necessity begin? There are answers to most of these questions to be found in the broad field of geographic comparison. But before we begin comparisons we must study the individual facts upon which they rest. These facts are of almost every conceivable variety. They range in importance from a humble shepherd's stone corral on a mountain slope to a thickly settled mountain basin. Their interpretation is to be sought now in the soil of rich playa lands, now in the fixed climatic zones and rugged relief of deeply dissected, lofty highlands in the tropics. Some of the controlling factors are historical, others economic; still other factors have exerted their influence through obscure psychologic channels almost impossible to trace. The *why* of man's distribution over the earth is one of the most complicated problems in natural science, and the solution of it is the chief problem of the modern geographer.

At first sight the mountain people of the Peruvian Andes seem to be uniform in character and in mode of life. The traveler's first impression is that the same stone-walled, straw-thatched type of hut is to be found everywhere, the same semi-nomadic life, the same degrees of poverty and filth. Yet after a little study the diversity of their lives is seen to be, if not a dominating fact, at least one of surprising importance. Side by side

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*A chapter from a book entitled "The Andes of Southern Peru" to be published by the American Geographical Society in 1916. Part of the work of the Yale Peruvian Expedition of 1911.

with this diversity there runs a corresponding diversity of relations to their physical environment. Nowhere else on the earth are greater physical contrasts compressed within such small spaces. If, therefore, we accept the fundamental theory of geography that there is a general, necessary, varied, and complex relation between man and the earth, that theory ought here to find a really vast number of illustrations. A glance at the accompanying figures discloses the wide range of relief in the Peruvian Andes. The corresponding range in climate and in life therefore furnishes an ample field for the application of the laws of human distribution.

In analyzing the facts of distribution we shall do well to begin with the causes and effects of migration. Primitive man is in no small degree a wanderer. His small resources often require him to explore large tracts. As population increases the food quest becomes more intense, and thus there come about repeated emigrations which increase the food supply, extend its variety, and draw the pioneers at last into contact with neighboring groups. The farther back we go in the history of the race the clearer it becomes that migrations lie at the root of much of human development. The raid for plunder, women, food, beasts, is a persistent feature of the life of those primitive men who live on the border of unlike regions.

The shepherd of the highland and the forest hunter of the plains perforce range over vast tracts, and each brings back to the home group news that confirms the tribal choice of habitation or sets it in motion toward a more desirable place. Superstitions may lead to flight akin to migration. Epidemics may be interpreted as the work of a malignant spirit from which men must flee. War may drive a defeated group into the fastnesses of a mountain forest where pursuit by stream or trail weakens the pursuer and confines his action, thereby limiting his power. Floods may come and destroy the cultivated spots. Want or mere desire in a hundred forms may lead to movement.

Even among forest tribes long stationary the facile canoe and the light household necessities may easily enable trivial causes to develop the spirit of restlessness. Pressure of population is a powerful but not a general cause of movement. It may affect the settled groups of the desert oases, or the dense population of fertile plains that are rooted in the soil. On the other hand mere whims may start a nomadic group toward a new goal. Often the goal is elusive and the tribe turns back to the old haunts or perishes in the shock of unexpected conflict.

In the case of both primitive societies and those of a higher order the causes and the results of migration are often contradictory. These will depend on the state of civilization and the extremes of circumstance. When the desert blooms the farmers of the Piura Valley in northwestern Peru turn shepherd and drive their flocks of sheep and goats out into the short-lived pastures of the great pampa on the west. In dry years they send them eastward into the mountains. The forest Indian of the lower Uru-

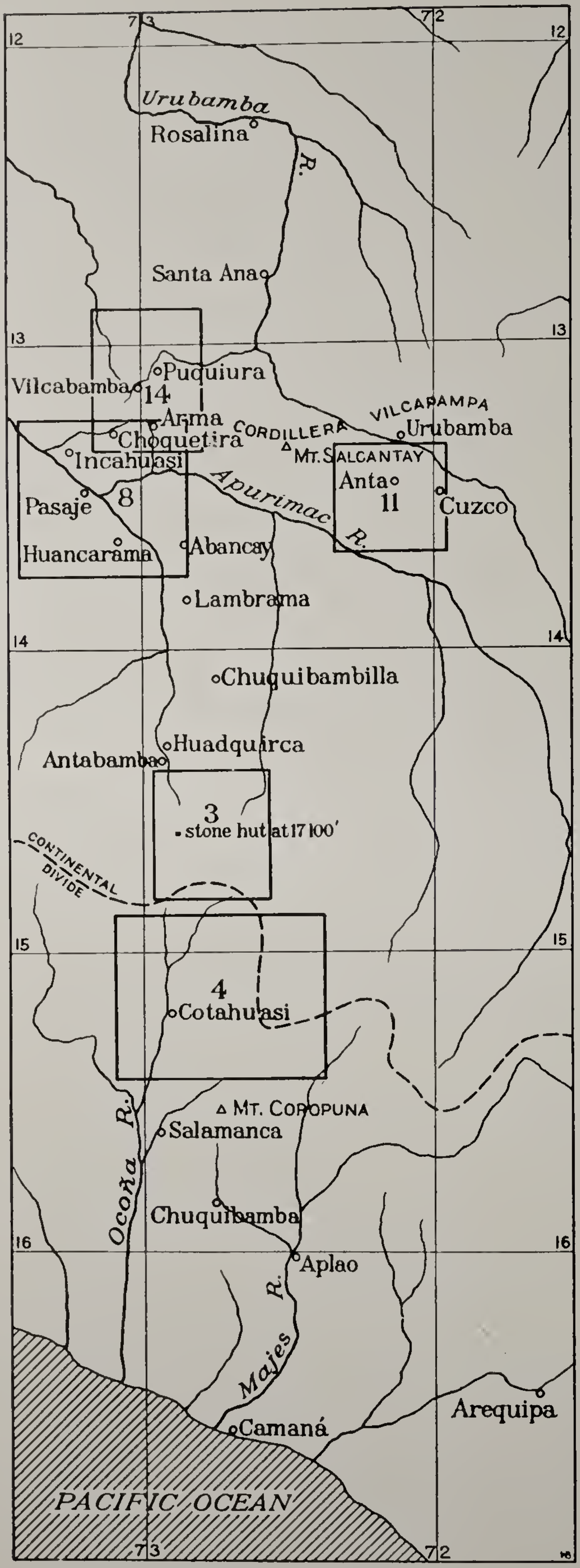

FIG. 2—Outline map of a part of the Andes of southern Peru showing the location of the regional diagrams and of the names mentioned in the text. Scale, 1:3,300,000. The large numbers in the rectangles correspond with the figure numbers.

bamba is a fisherman while the river is low and lives in a reed hut beside his cultivated patch of cane and yuca. When the floods come he is driven to the higher ground in the hills where he has another cultivated patch of land and a rude shelter. To be sure, these are seasonal migrations, yet through them the country becomes better known to each new generation of men. And each generation supplies its pioneers, who drift into the remoter places where population is scarce or wanting altogether.

Dry years and extremely dry years may have opposite effects. When moderate dryness prevails the results may be endurable. The oases become crowded with men and beasts just when they can ill afford to support them. The alfalfa meadows become overstocked, and cattle become lean and almost worthless. But there is at least bare subsistance. By contrast, if extreme and prolonged drought prevails, some of the people are driven forth to more favored spots. At Vallenar in central Chile, some of the workmen in extreme years go up to the nitrate pampa; in wet years they return. When the agents of the nitrate companies hear of hard times in a desert valley they offer employment to the stricken people. It not infrequently happens that when there are droughts in desert Chile there are abundant rains in Argentina on the other side of the Cordillera. There has therefore been for many generations an irregular and slight, though definite, shifting of population from one side of the mountains to the other as periods of drought and periods of rain alternated in the two regions. Some think there is satisfactory evidence to prove that a number of the great Mongolian emigrations took place in wet years when pasture was abundant and when the pastoral nomad found it easy to travel. On the other hand it has been urged that the cause of many emigrations was prolonged periods of drought when the choice lay between starvation and flight. It is evident from the foregoing that both views may be correct in spite of the fact that identical effects are attributed to opposite causes.

It is still an open question whether security or insecurity is more favorable for the broad distribution of the Peruvian Indians of the mountain zone which form the subject of this paper. Certainly both tend to make the remoter places better known. Tradition has it that, in the days of intertribal conflict before the Conquest, fugitives fled into the high mountain pastures and lived in hidden places and in caves. Life was insecure and relief was sought in flight. On the other hand peace has brought security to life. The trails are now safe. A shepherd may drive his flock anywhere. He no longer has any one to fear in his search for new pastures. It would perhaps be safe to conclude that there is equally broad distribution of men in the mountain pastures in time of peace and in time of war. There is, however, a difference in the kind of distribution. In time of peace the individual is safe anywhere; in time of unrest he is safe only when isolated and virtually concealed. By contrast, the group living near the trails is scattered by plundering bands and war parties. The remote and isolated group may successfully oppose the smaller band and the individuals that might reach the remoter regions. The fugitive group would have nothing to fear from large bands, for the limited food supply would inevitably cause these to disintegrate upon leaving the main routes of travel. Probably the fullest exploration of the mountain pastures has resulted from the alternation of peace and war. The opposite conditions which these establish foster both kinds of distribution; hence both the remote group life encouraged by war and the individual's lack of restraint in time of peace are probably in large part responsible for the present widespread occupation of the Peruvian mountains.

The loftiest habitation in the world (Fig. 1) is in Peru. Between Antabamba and Cotahuasi occur the highest passes in the Maritime Cordillera. We crossed at 17,400 feet, and three hundred feet lower is the last outpost of the Indian shepherds. The snowline, very steeply canted away from the sun, is between 17,200 and 17,600 feet. At frequent intervals during the three months of winter, snowfalls during the night and terrific hailstorms in the late afternoon drive both shepherds and flocks to the shelter of leeward slopes or steep canyon walls. At our six camps, between 16,000 and 17,200 feet in September, 1911, the minimum temperature

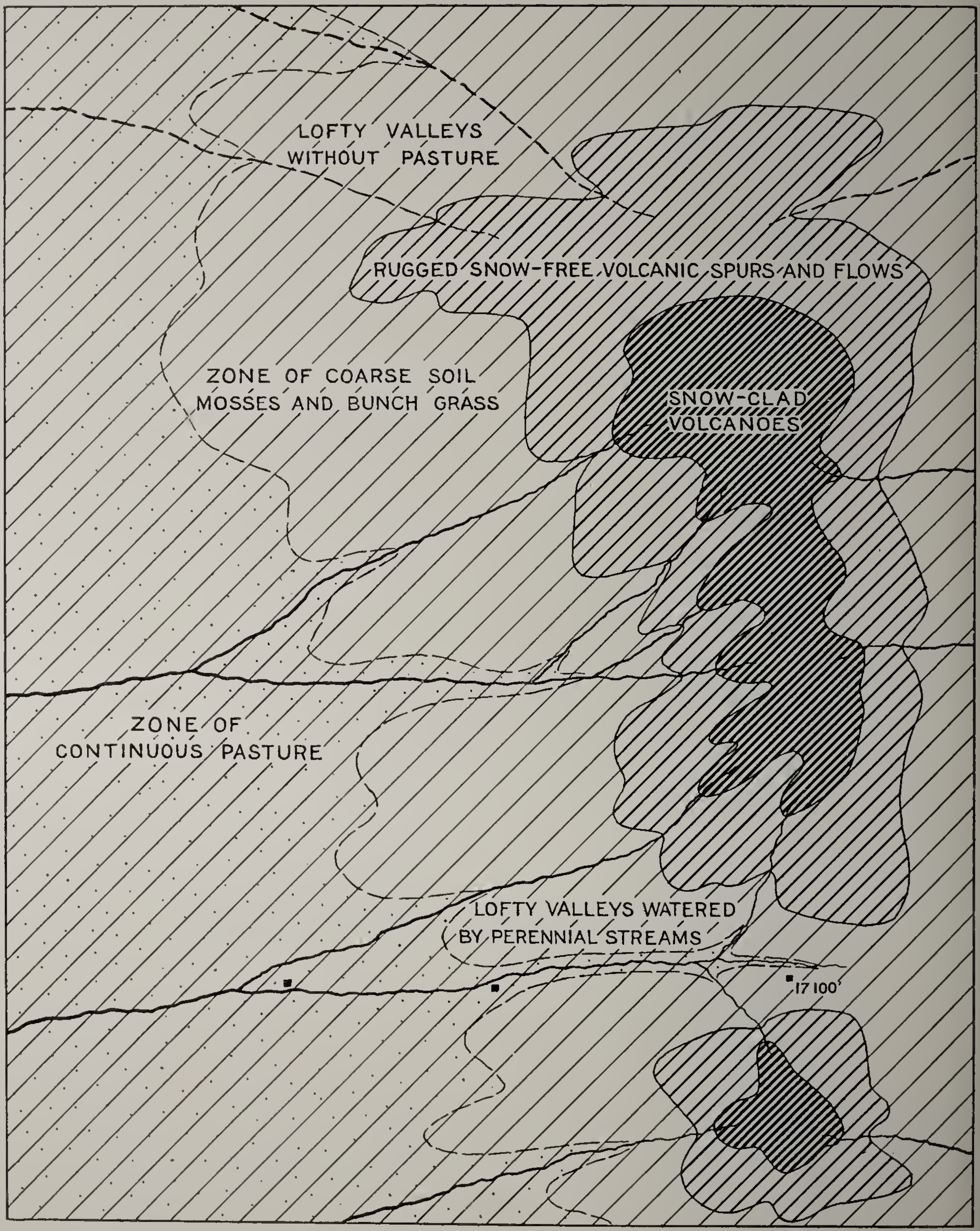

Fig. 3—Regional diagram for the Maritime Cordillera to show the physical relations in the district where the highest habitations in the world are located. For location, see Fig. 2. It should be remembered that the orientation of these diagrams is generalized. By reference to Fig. 2 it will be seen that some portions of the crest of the Maritime Cordillera run east and west and others north and south. The same is true of the Cordillera Vilcapampa, Fig. 14.

Note on regional diagrams.—For the sake of clearness I have classified the accompanying facts of human distribution in the country of the shepherds and represented them graphically in "regional" diagrams, Figs. 3, 4, 8, 11, and 14. Because they are presented here for the first time a word of explanation is desirable. They are constructed on the principle of dominant control. Each brings out the factors of greatest importance in the distribution of the people in a given region. Furthermore, the facts are compressed within the limits of a small rectangle. This compression, though great, respects all essential relations. For example, every location on these diagrams has a concrete illustration but the accidental relations of the field have been omitted; the essential relations are preserved. Each diagram is, there-

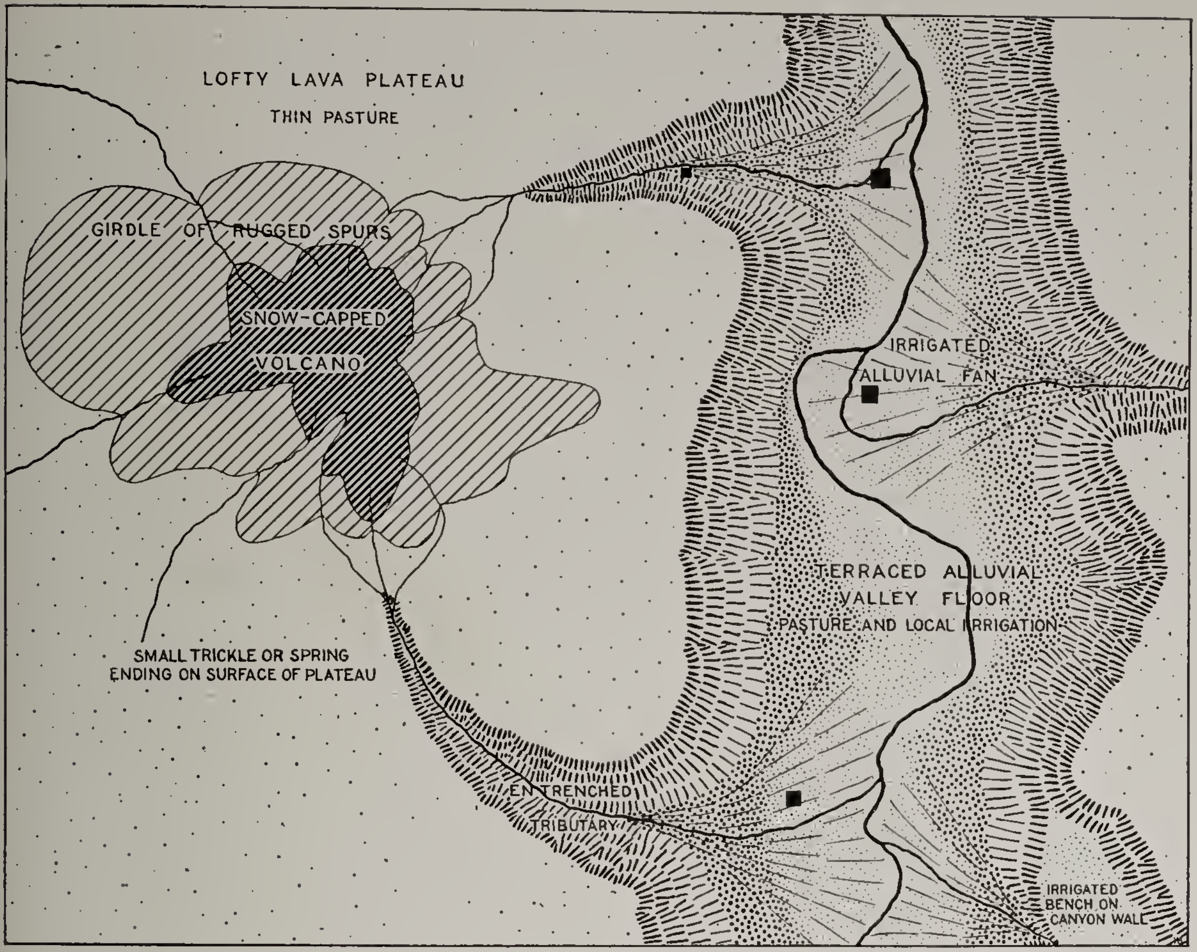
LOFTY LAVA PLATEAU
THIN PASTURE
GIRDLE OF RUGGED SPURS
SNOW-CAPPED VOLCANO
SMALL TRICKLE OR SPRING ENDING ON SURFACE OF PLATEAU
ENTRENCHED TRIBUTARY
IRRIGATED ALLUVIAL FAN
TERRACED ALLUVIAL VALLEY FLOOR
PASTURE AND LOCAL IRRIGATION
IRRIGATED BENCH ON CANYON WALL

FIG. 4—Regional diagram to show the physical relations in the lava plateau of the Maritime Cordillera west of the continental divide. For location, see Fig. 2. Trails lead up the entrenched tributaries. If the irrigated bench (lower right corner) is large, a town will be located on it. Shepherds' huts are scattered about the edge of the girdle of spurs. There is also a string of huts in the deep sheltered head of each tributary. See also Fig. 5 for conditions on the valley or canyon floor.

ranged from 4° to 20° F. The thatched stone hut that we passed at 17,100 feet and that enjoys the distinction of being the highest in the world was in other respects the same as the thousands of others in the same region.

fore, a kind of generalized type map. It bears somewhat the same relation to the facts of human geography that a block diagram does to physiography. The darkest shading represents steep snow-covered country; the next lower grade represents rough but snow-free country; the lightest shading represents moderate relief; and no shading represents plain or plateau. Small circles represent forest or woodland; small open-spaced dots, grassland. Fine alluvium is represented by small closely spaced dots; coarse alluvium by large closely spaced dots.

To take an illustration. In Figure 8 we have the Apurimac region near Pasaje (see location map, Fig. 2). At the lower edge of the rectangle is a snow-capped outlier of the Cordillera Vilcapampa. The belt of rugged country represents the lofty, steep, exposed, and largely inaccessible ridges at the mid-elevations of the mountains below the glaciated slopes at the heads of tributary valleys. The villages in the belt of pasture might well be Incahuasi and Patapampa. The floors of the large canyons on either hand are bordered by extensive alluvial fans. The river courses are sketched in a diagrammatic way only, but a map would not be different in its general disposition. Each location is justified by a real place with the same essential features and relations. In making the change there has been no alteration of the general relation of the alluvial lands to each other or to the highland. By suppressing unnecessary details there is produced a diagram whose essentials have simple and clear relations. When such a regional diagram is amplified, as in this article, by photographs of real conditions it becomes a sort of generalized picture of a large group of geographic facts. One could very well extend the method to the whole of South America. It would be a real service to geography to draw up a set of, say, twelve to fifteen regional diagrams, still further generalized, for the whole of the continent. As a broad classification they would serve both the specialist and the general student. As the basis for a regional map of South America they would be invaluable if worked out in sufficient detail and constructed on the indispensable basis of field studies.

It sheltered a family of five. As we passed, three rosy-cheeked children almost as fat as the sheep about them were sitting on the ground in a corner of the corral playing with balls of wool. Hundreds of alpacas and sheep grazed on the hill slopes and valley floor, and their tracks showed plainly that they were frequently driven up to the snowline in those valleys where a trickle of water supported a band of pasture. Less than a hundred feet below them were other huts and flocks.

Here we have the limits of altitude and the limits of resources. The intervalley spaces do not support grass. Some of them are quite bare, others are covered with mosses. It is too high for even the tola bush—that pioneer of Alpine vegetation in the Andes. The distance[1] to Cotahuasi is 75 miles, to Antabamba 50 miles. Thence wool must be shipped by muleback to the railroad in the one case 250 miles to Arequipa, in the other case 200 miles to Cuzco. Even the potatoes and barley, which must be imported, come from valleys several days' journey away. The question naturally arises why these people live on the rim of the world. Did they seek out these neglected pastures, or were they driven to them? Do they live here by choice or of necessity? The answer to these questions introduces two other geographic factors, the one physical, the other commercial, which we shall now examine.

The main tracts of lofty pasture above Antabamba cover mountain slopes and valley floor alike, but the moist valley floors supply the best grazing (Fig. 3). Moreover, the main valleys have been intensively glaciated. Hence, though their sides are steep walls, their floors are broad and flat. Marshy tracts, periodically flooded, are scattered throughout, and here and there are overdeepened portions where lakes have gathered. There is a thick carpet of grass, also numerous huts and corrals, and many flocks. At the upper edge of the main zone of pasture the grasses become thin and with increasing altitude give out altogether except along the moist valley floors or on shoulders where there is seepage.

If the streams head in dry mountain slopes without snow the grassy bands of the valley floor terminate at moderate elevations. If the streams have their sources in snowfields or glaciers there is a more uniform run-off, and a ribbon of pasture may extend to the snowline. To the latter class belong the pastures that support these remote people.

In the case of the Maritime Andes the great elevation of the snowline is also a factor. If, in Figure 3, we think of the snowline as at the upper level of the main zone of pasture then we would have the conditions shown in Figure 14, where the limit of general, not local occupation is the snowline, as in the Cordillera Vilcapampa and between Chuquibambilla and Antabamba.

A third factor is the character of the soil. Large amounts of volcanic ash and lapilli were thrown out in the late stages of volcanic eruption in

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[1] Distances are not taken from the map but from the trail.

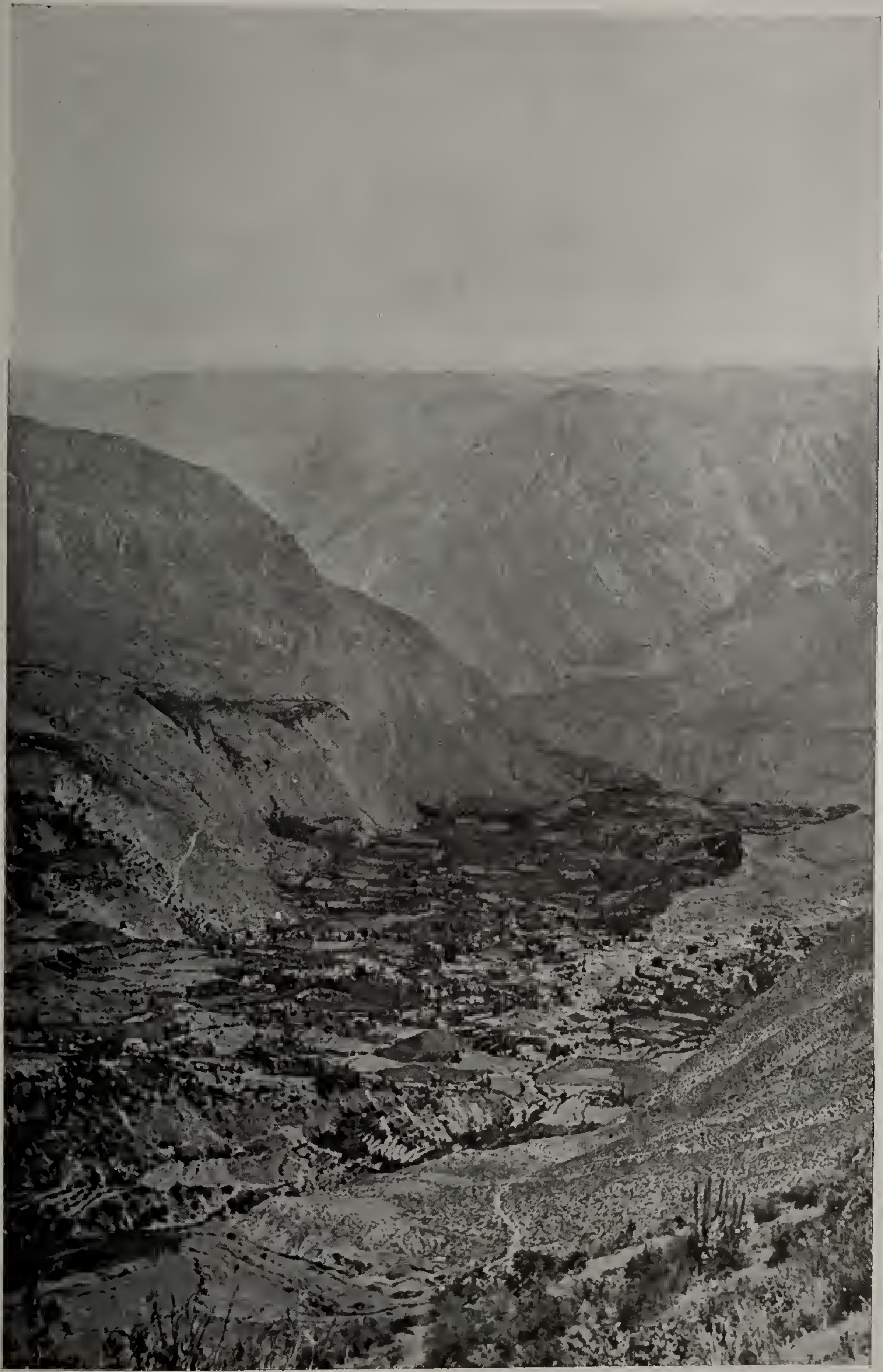

FIG. 5—Cotahuasi on the floor of the Cotahuasi canyon. The even skyline of the background is on a rather even-topped lava plateau. The terrace on the left of the town is formed on limestone, which is overlaid by lava flows. A thick deposit of terraced alluvium may be seen on the valley floor, and it is on one of the lower terraces that the city of Cotahuasi stands. The higher terraces are in many cases too dry for cultivation. The canyon is nearly 7,000 feet deep and has been cut through over one hundred principal lava flows.

which the present cones of the Maritime Andes were formed. The coarse texture of these deposits allows the ready escape of rainwater. The combination of extreme aridity and great elevation results in a double restraint upon vegetation. Outside of the moist valley floors, with their film of ground moraine on whose surface plants find a more congenial soil, there is an extremely small amount of pasture. Here are the natural grazing grounds of the fleet vicuña. They occur in hundreds, and so remote and little disturbed are they that near the main pass one may count them by the score. As we rode by, many of them only stared at us without taking the trouble to get beyond rifle shot. It is not difficult to believe that the Indians easily shoot great numbers in remote valleys that have not been hunted for years.

The extreme conditions of life existing on these lofty plateaus is well shown by the readiness with which even the hardy shepherds avail themselves of shelter. Wherever deep valleys bring a milder climate within reach of the pastures the latter are unpopulated for miles on either side. The sixty-mile stretch between Chuquibamba and Salamanca is without even a single hut, though there are pastures superior to the ones occupied by those loftiest huts of all. Likewise there are no permanent homes between Salamanca and Cotahuasi, though the shepherds migrate across this belt in the milder season of rain. Eastward and northward toward the crest of the Maritime Cordillera there are no huts within a day's journey of the Cotahuasi canyon. Then there is a group of a dozen just under the crest of the secondary range that parallels the main chain of volcanoes. Thence northward there are a number of scattered huts between 15,500 and 16,500 feet, until we reach the highest habitations of all at 17,100 feet.

The unpopulated belts of lava plateau bordering the entrenched valleys are, however, as distinctly "sustenance" spaces, to use Penck's term, as the irrigated and fertile alluvial fans in the bottom of the valley. This is well shown when the rains come and flocks of llamas and sheep are driven forth from the valleys to the best pastures. It is equally well shown by the distribution of the shepherds' homes. These are not down on the warm canyon floor, separated by a half day's journey from the grazing. They are in the entrenched tributary valleys of Figure 4 or just within the rim of the canyon. It is not shelter from the cold but from the wind that chiefly determines their location. They are also kept near the rim of the canyon by the pressure of the farming population from below. Every hundred feet of descent from the arid plateau (Fig. 5) increases the water supply. Springs increase in number and size; likewise belts of seepage make their appearance. The gradients in many places diminish, and flattish spurs and shoulders interrupt the generally steep descents of the canyon wall. Every change of this sort has a real value to the farmer and means an enhanced price beyond the ability of the poor shepherd to pay. If you ask a wealthy *hacendado* on the valley floor (Figs. 5 and 6), who it is that live in the huts above him, he will invariably say "los Indios," with a shrug meant to convey the idea of poverty and worthlessness. Sometimes it is "los Indios pobres," or merely "los pobres." Thus there is a vertical stratification of society corresponding to the superimposed strata of climate and land.

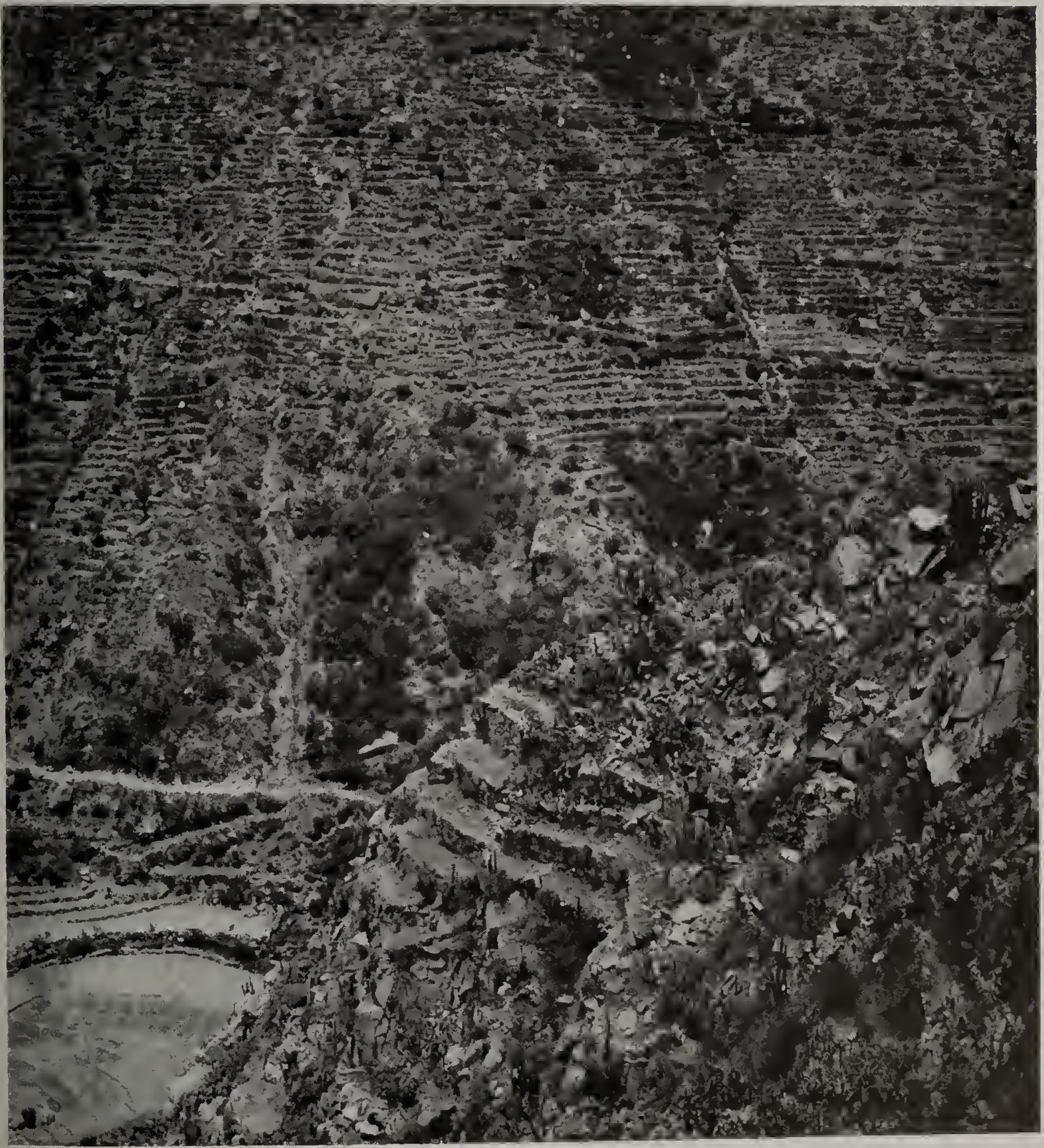

FIG. 6—Terraced hill slopes near Salamanca. There is no part of the photograph which is not covered with terraces save a few places where bushy growths are visible or where torrents descend through artificial canals.

At Salamanca (Fig. 7) I saw this admirably displayed under circumstances of unusual interest. The floor and slopes of the valley are more completely terraced than in any other valley I know of. In the photograph, Figure 6, which shows at least 2,500 feet of descent near the town, one cannot find a single patch of surface that is not under cultivation. The valley is simply filled with people to the limit of its capacity. Practically all are

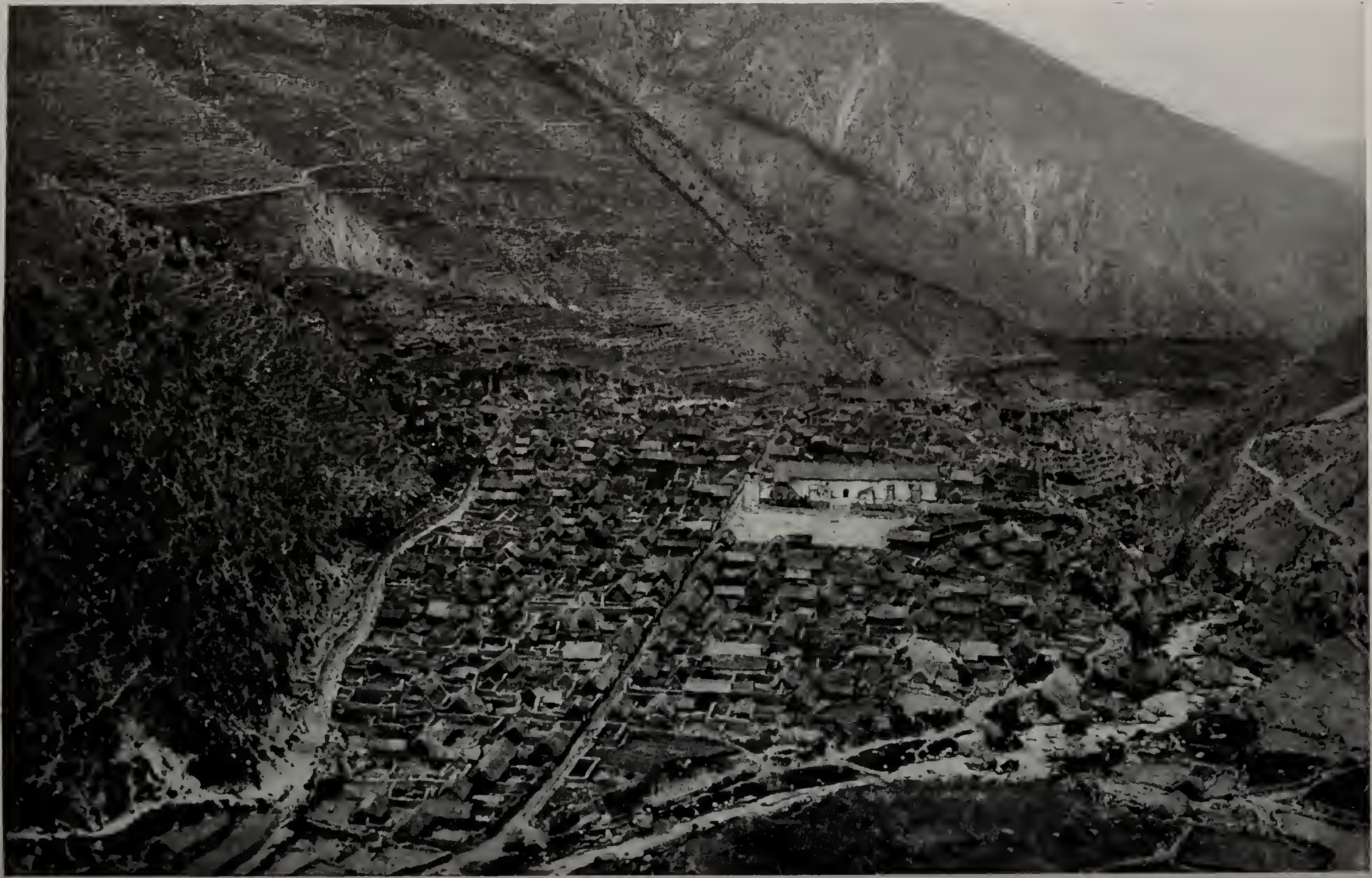

Fig. 7—Salamanca, on the floor of the deep Arma valley, which is really a canyon above this point and which, in spite of its steepness, is thoroughly

Indians, but with many grades of wealth and importance. When we rode out of the valley before daybreak, one September morning in 1911, there was a dead calm, and each step upward carried us into a colder stratum of air. At sunrise we had reached a point about 2,000 feet above the town, or 14,500 feet above sea level. We stood on the frost line. On the opposite wall of the valley the line was as clearly marked out as if it had been an irrigating canal. The light was so fully reflected from the millions of frost crystals above it that both the mountainside and the valley slopes were sparkling like a ruffled lake at sunrise. Below the frost line the slopes were dark or covered with yellow barley and wheat stubble or green alfalfa.

It happened that the frost line was near the line of division between corn and potato cultivation and also near the line separating the steep rough upper lands from the cultivable lower lands. Not a habitation was in sight above us, except a few scattered miserable huts near broken terraces, gullied by wet-weather streams and grown up to weeds and brush. Below us were well-cultivated fields, and the stock was kept in bounds by stone fences and corrals; above, the half-wild burros and mules roamed about everywhere, and only the sheep and llamas were in rude enclosures. Thus in a half hour we passed the frontier between the agricultural folk below the frost line and the shepherd folk above it.

In a few spots the line followed an irregular course, as where flatter lands were developed at unusual elevations or where air drainage altered the normal temperature. And at one place the frost actually stood on the young corn, which led us to speculate on the possibility of securing from Salamanca a variety of maize that is more nearly resistant to light frosts than any now grown in the United States. In the endless and largely unconscious experimentation of these folk perched on the valley walls a result may have been achieved ahead of that yet reached by our professional experimenters. Certain it is that nowhere else in the world has the potato been grown under such severe climatic conditions as in its native land of Peru and Bolivia. The hardiest varieties lack many qualities that we prize. They are small and bitter. But at least they will grow where all except very few cultivated plants fail, and they are edible. Could they not be imported into Canada to push still farther northward the limits of cultivation? Potatoes are now grown at Forts Good Hope and McPherson in the lower Mackenzie basin. Would not the hardiest Peruvian varieties grow at least as far north as the continental timber line? I believe they could be grown still farther north. They will endure repeated frosts. They need scarcely any cultivation. Prepared in the Peruvian manner, as *chuña,* they could be kept all winter. Being light, the meal derived from them could be easily packed by hunters and prospectors. An Indian will carry in a pouch enough to last him a week. Why not use it north of the continental limit of other cultivated plants since it is the pioneer above the frost line on the Peruvian mountains?

The relation between farmer and shepherd or herdsman grows more complex where deeper valleys interrupt the highlands and mountains. Figure 8 represents typical relations, though based chiefly on the Apurimac

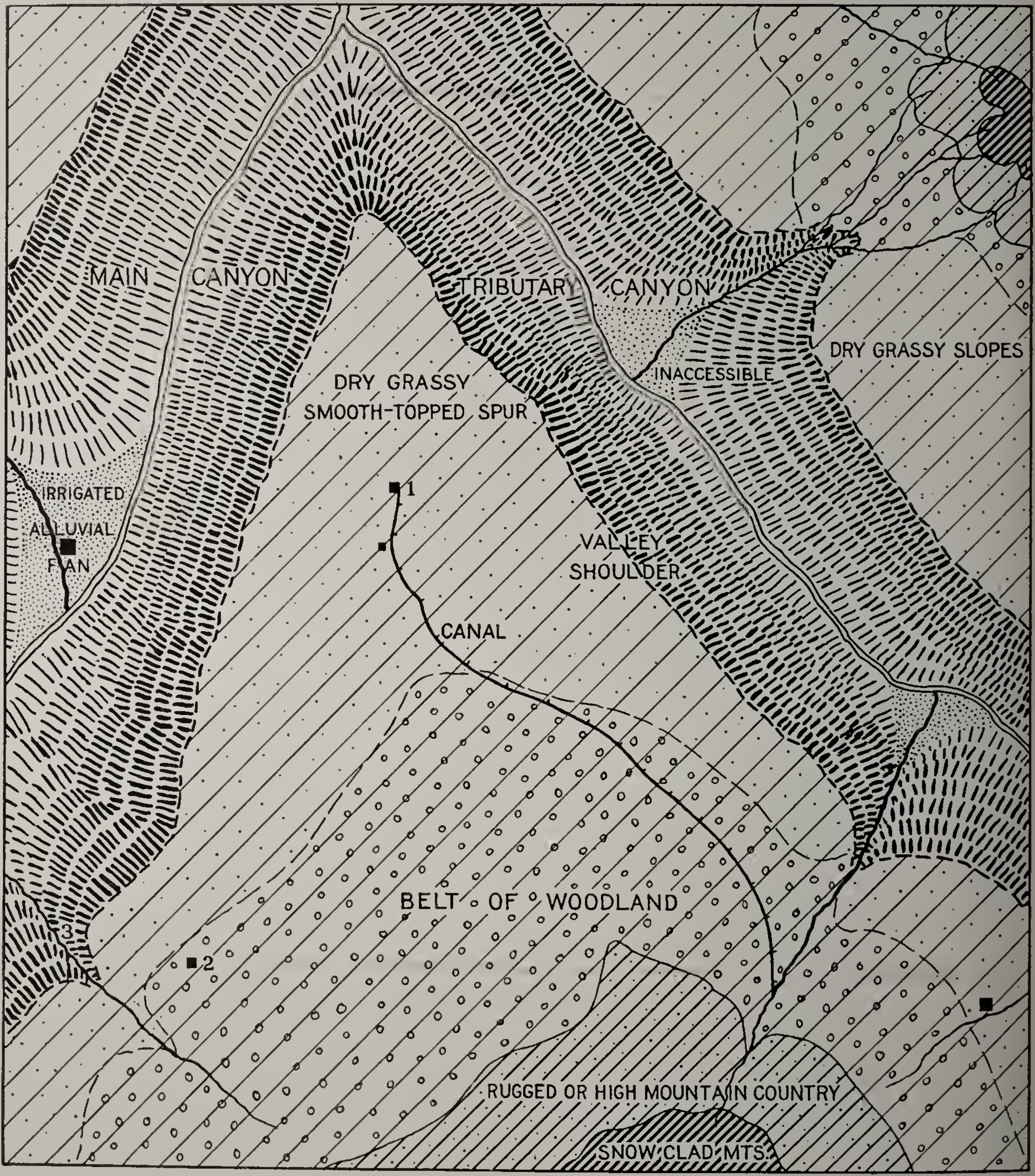

FIG. 8—Regional diagram representing the deep canyoned country west of the Eastern Cordillera in the region of the Apurimac. For photograph see Fig. 10. For further description see footnote to Fig. 3. Numbers 1, 2, and 3 correspond in position to the same numbers in Fig. 9.

canyon and its surroundings near Pasaje. First there is the snow-clad region at the top of the country. Below it are grassy slopes, the homes of mountain shepherds, or rugged mountain country unsuited for grazing. Still lower there is woodland, in patches chiefly, but with a few large continuous tracts. The shady sides of the ravines and the mountains have the most moisture, hence bear the densest growths. Finally, the high country terminates in a second belt of pasture below the woodland.

Wherever streams descend from the snow or woodland country there is water for the stock above and for irrigation on the alluvial fan below. But

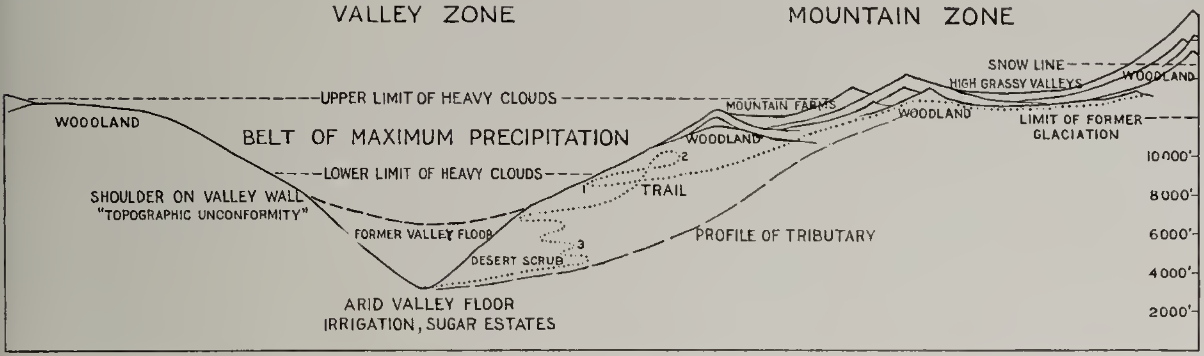

Fig. 9—Valley climates of the canyoned region shown in Figs. 8 and 10.

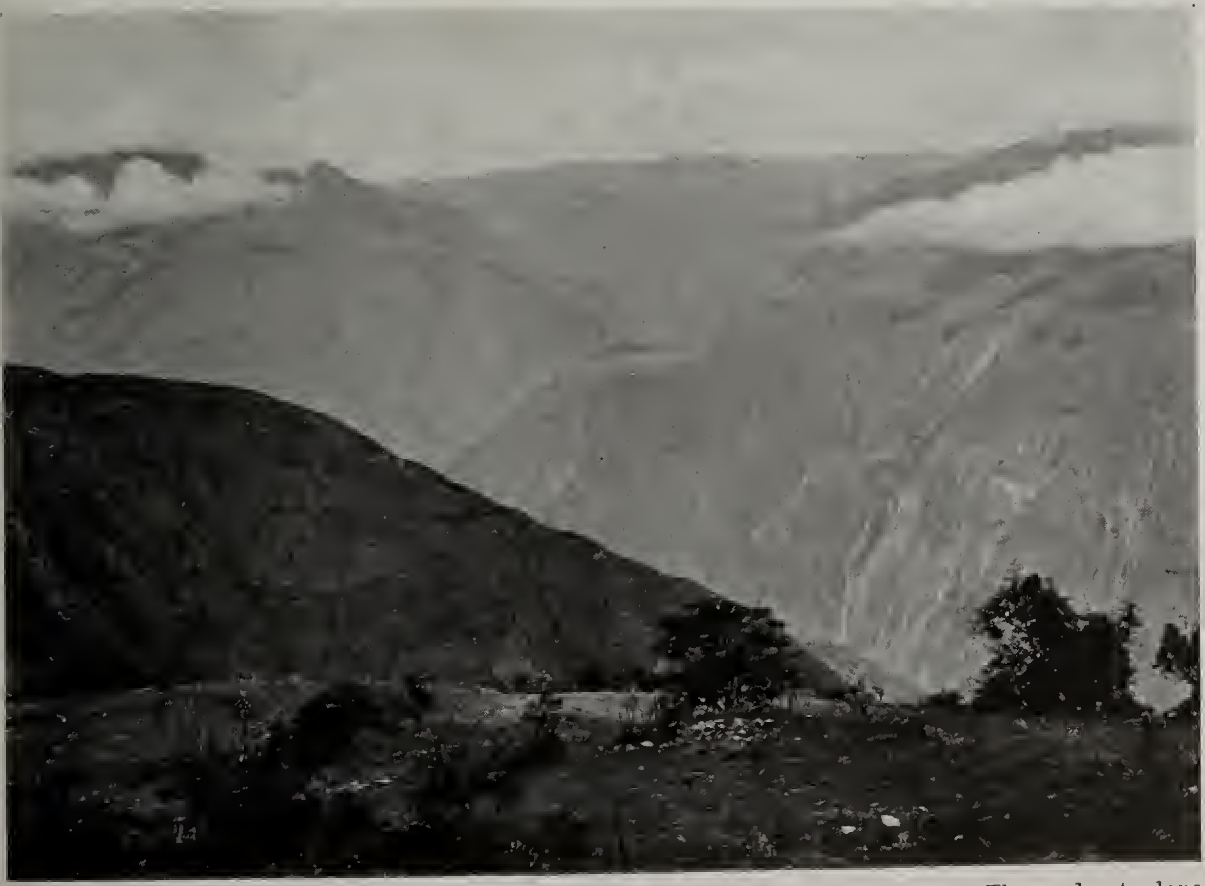

Fig. 10—The Apurimac canyon near Incahuasi above Pasaje. See Figs. 2 and 8. The moderate slope in the immediate foreground is repeated (a) on the summit of the dark spur on the left, (b) on the spur that interlocks with it in the center, and (c) just under the clouds on the extreme left. In contrast are the precipitous inner walls of the canyon. It is 8,000 feet from the clouds to the canyon floor.

the spur ends dropping off abruptly several thousand feet have a limited area and no running streams, and the ground water is hundreds of feet down. There is grass for stock, but there is no water. In some places the stock is driven back and forth every few days. In a few places water is brought to the stock by canal from the woodland streams above, as at Incahuasi (Figs. 2 and 8). In the same way a canal brings water to Pasaje *hacienda* from a woodland strip many miles to the west. The little canal in the figure is almost a toy construction a few inches wide and deep and conveying only a trickle of water. Yet on it depends the settlement at the spur end, and if it were cut the people would have immediately to repair it or establish new homes.

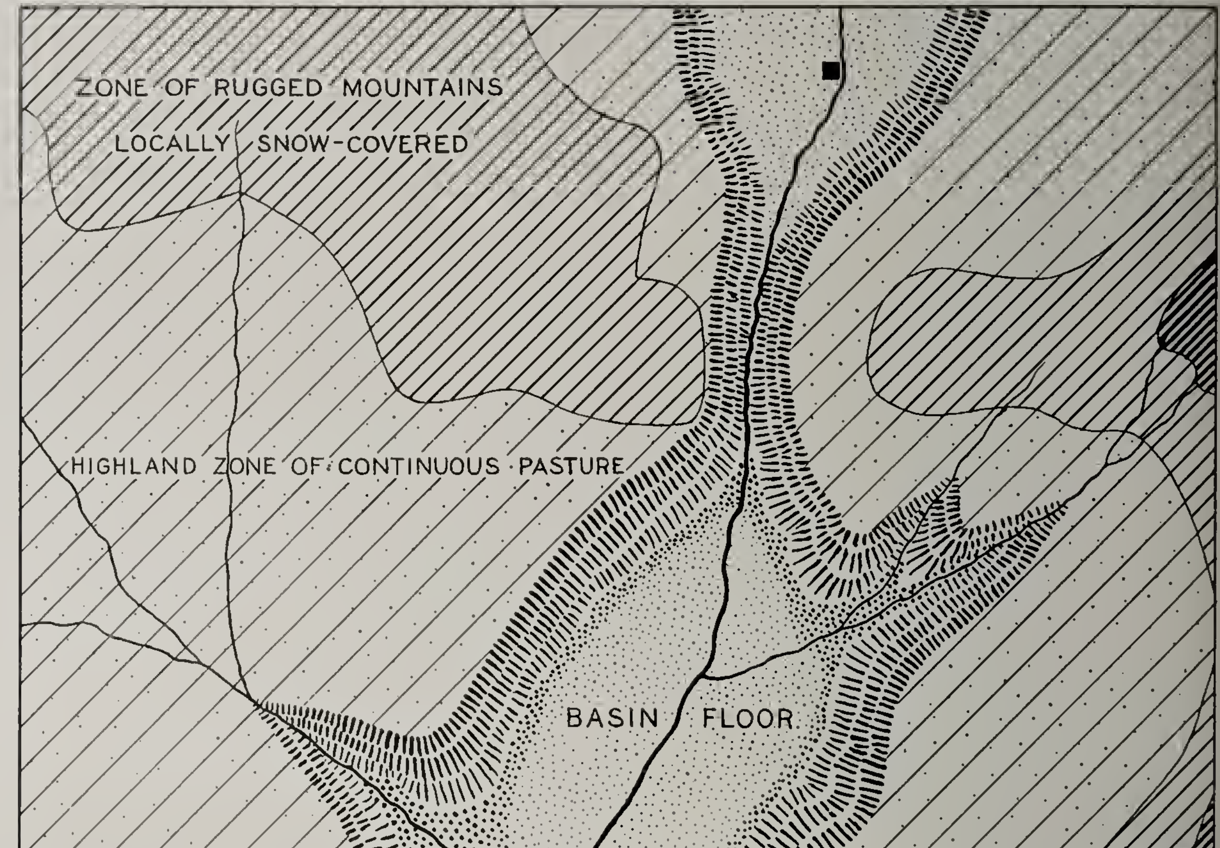

FIG. 11—Regional diagram to show the typical physical conditions and relations in an intermont basin in the Peruvian Andes. See also Fig. 13. In addition to reference to the note under Fig. 3 it should be emphasized that this is not a "map" of the Cuzco basin. While the conditions in that basin are the chief basis of the diagram, the generalization has been extended to illustrate many basins.

The canal and the pasture are possible because the slopes are moderate. They were formed in an earlier cycle of erosion when the land was lower. They are hung midway between the rough mountain slopes above and the steep canyon walls below (Fig. 10). Their smooth descents and gentle profiles are in very pleasing contrast to the rugged scenery about them. The trails follow them easily. Where the slopes are flattest, farmers have settled and produce good crops of corn, vegetables, and barley. Some farmers have even developed three- and four-story farms. On an alluvial fan in the

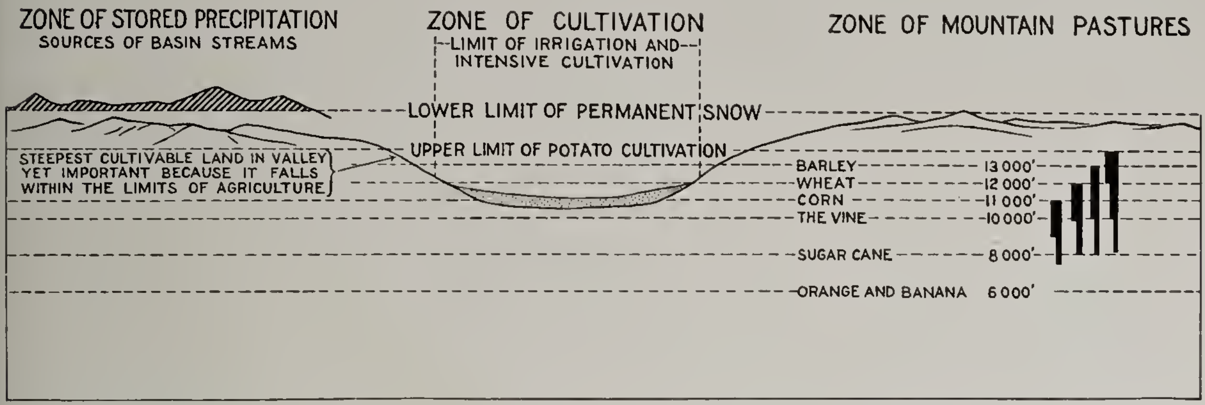
ZONE OF STORED PRECIPITATION
SOURCES OF BASIN STREAMS
ZONE OF CULTIVATION
LIMIT OF IRRIGATION AND INTENSIVE CULTIVATION
ZONE OF MOUNTAIN PASTURES
LOWER LIMIT OF PERMANENT SNOW
UPPER LIMIT OF POTATO CULTIVATION
STEEPEST CULTIVABLE LAND IN VALLEY YET IMPORTANT BECAUSE IT FALLS WITHIN THE LIMITS OF AGRICULTURE
BARLEY 13 000'
WHEAT 12 000'
CORN 11 000'
THE VINE 10 000'
SUGAR CANE 8 000'
ORANGE AND BANANA 6 000'

FIG. 12—Climatic cross-section showing the location of various zones of cultivation and pasture in a typical intermont basin in the Peruvian Andes. The thickness of the dark symbols on the right is proportional to the amount of each staple that is produced at the corresponding elevation.

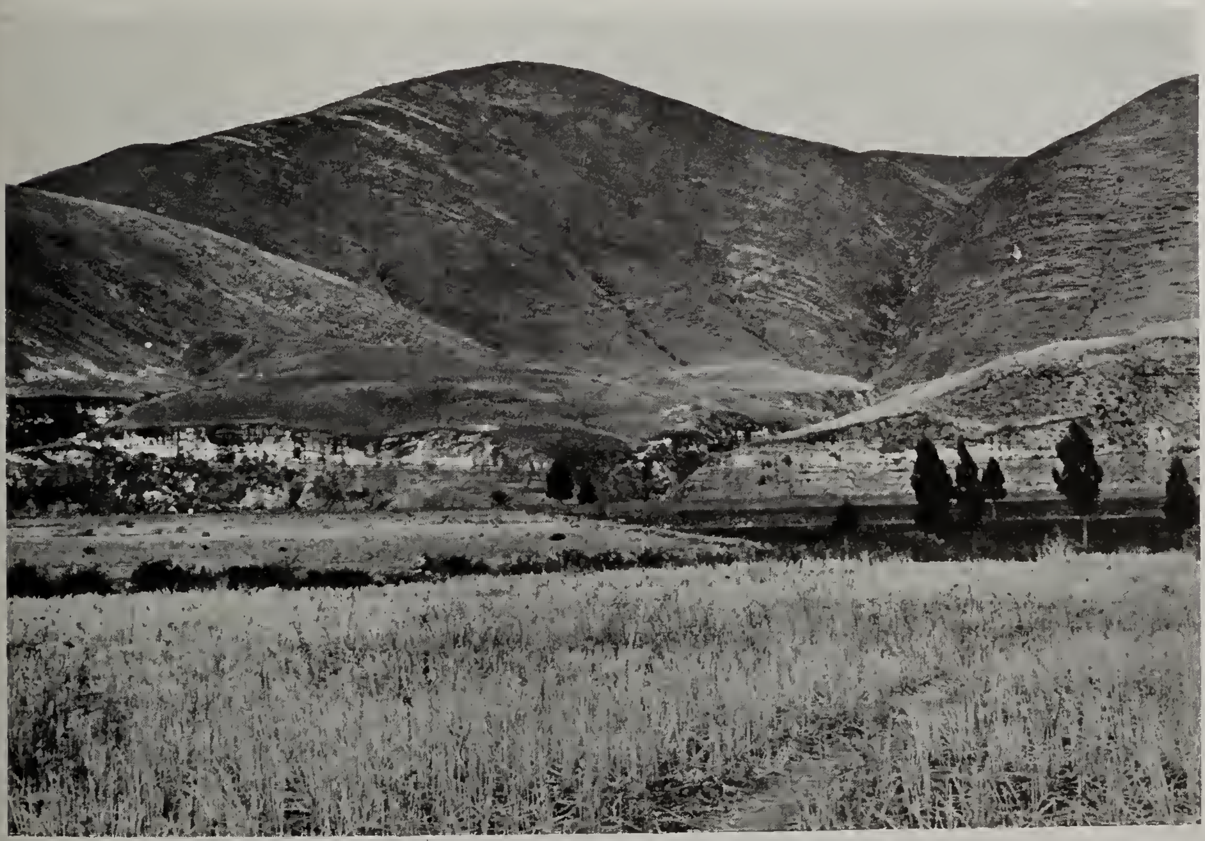

FIG. 13—Composition of topography on the edge of an intermont basin (Cuzco). The crest of the hills is the edge of a plateau devoted to grazing. Farms and pastures are developed on the lower levels of the hillslopes in the picture. There is a border zone of coarse gravels or benchland of older strata. In the foreground is younger alluvium which forms the highly cultivated floor of the valley. See also Fig. 11.

main valley they raise sugar cane and tropical and subtropical fruits; on the flat upper slopes they produce corn; in the moister soil near the edge of the woodland are fields of mountain potatoes; and the upper pastures main-

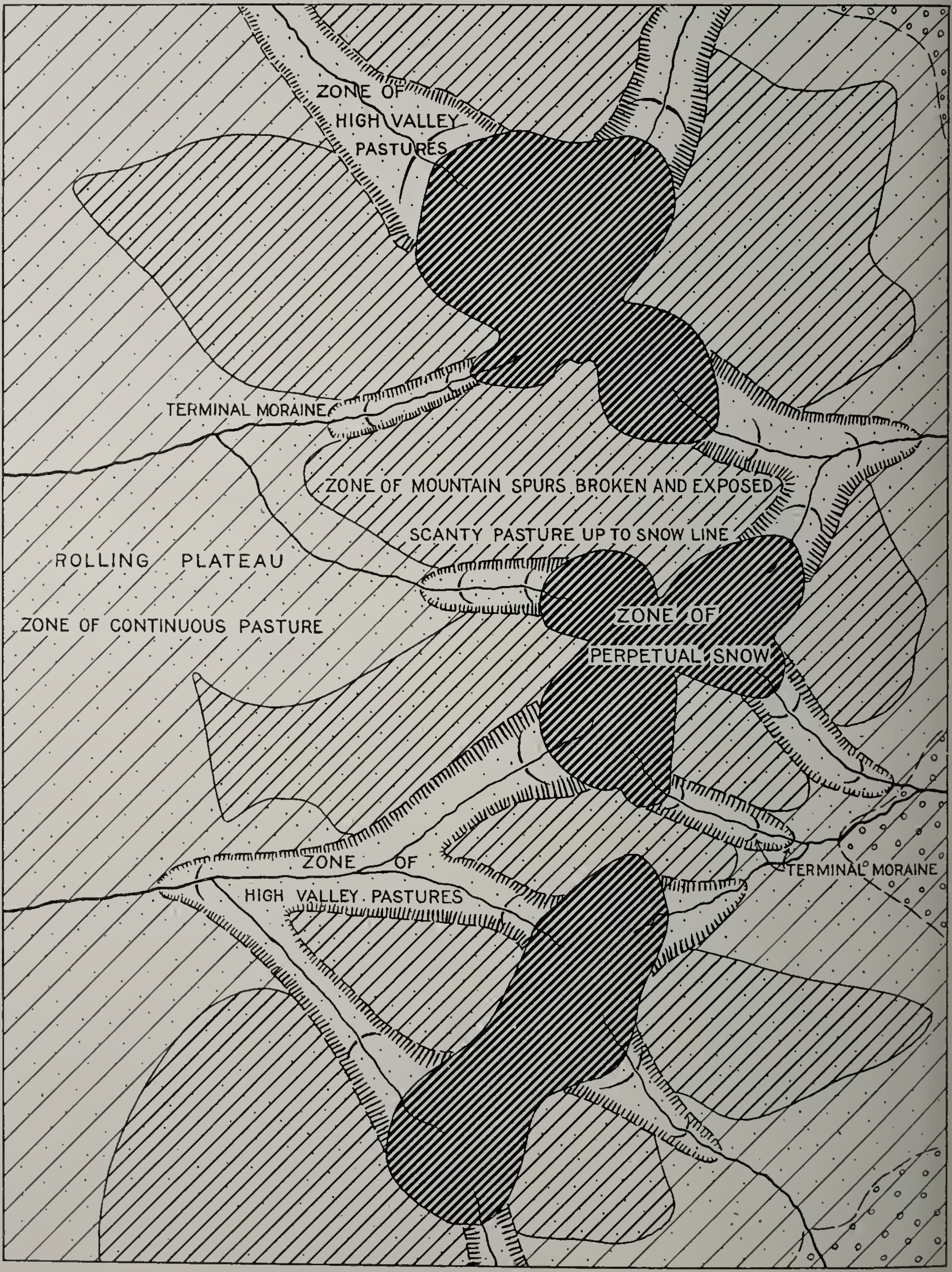

FIG. 14—Regional diagram for the Eastern Cordillera or Cordillera Vilcapampa. Note the crowded zones on the right (east and north) in contrast to the open succession on the left. In sheltered places woodland extends even higher than shown. At several points patches of it grow right under the snowline. Other patches grow on the floors of the glaciated valley troughs.

tain flocks of sheep. In one district this change takes place in a distance that may be covered in five hours. Generally it is at least a full and hard day's journey from one end of the series to the other.

Wherever these features are closely associated they tend to be controlled by the planter in some deep valley thereabouts. Where they are widely scattered the people are independent, small groups living in places nearly inaccessible. Legally they are all under the control of the owners of princely tracts that take in the whole country, but the remote groups are left almost wholly to themselves. In most cases they are supposed to sell their few commercial products to the *hacendado* who nominally owns their land, but the administration of this arrangement is left largely to chance. The shepherds and small farmers near the plantation are more dependent upon the planter for supplies, and also their wants are more varied and numerous. Hence they pay for their better location in free labor and in produce sold at a discount.

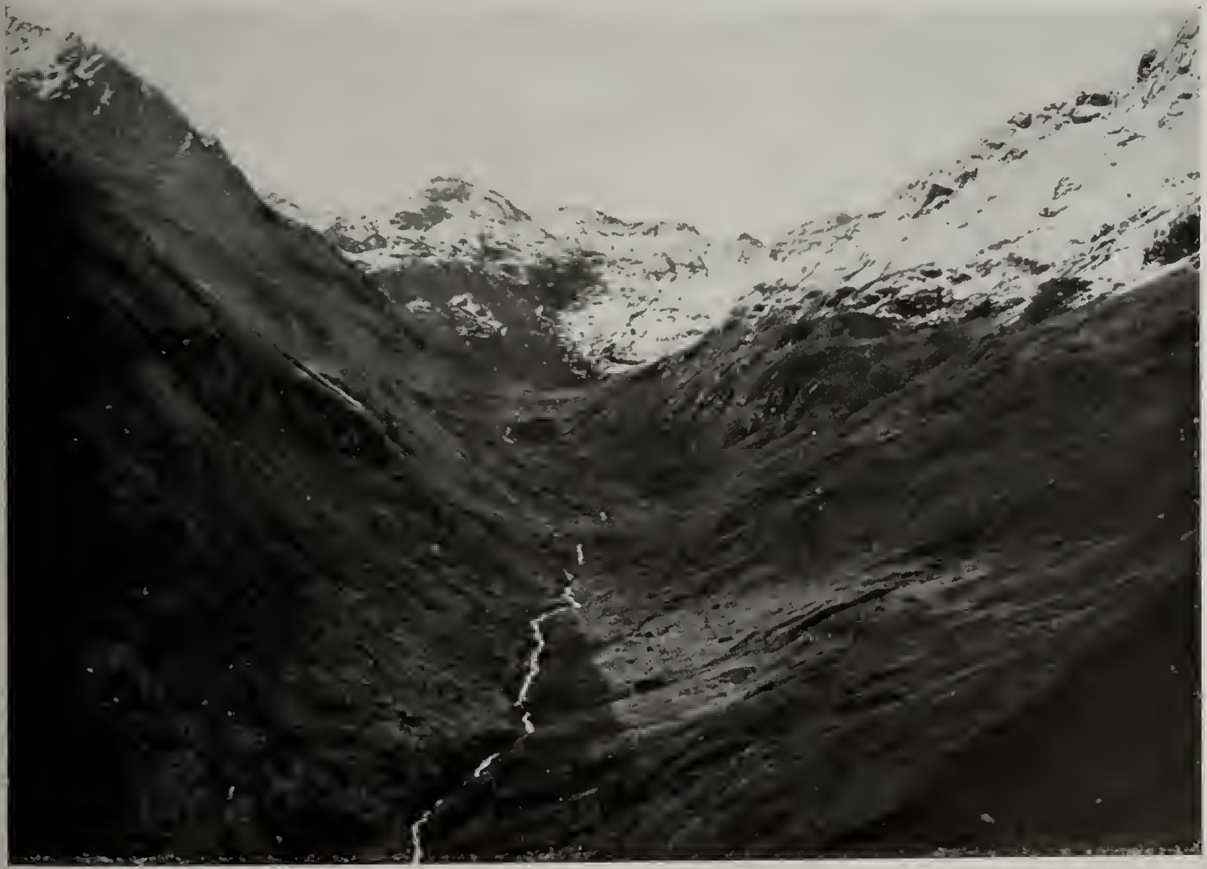

FIG. 15—Looking up a spurless flat-floored glacial trough near the pass in the Cordillera Vilcapampa from 14,200 feet. Note the looped terminal and lateral moraines on the steep valley wall on the left. A stone fence from wall to wall serves to enclose the flock of the mountain shepherd.

So deep are some of the main canyons, like the Apurimac and the Cotahuasi, that their floors are arid or semi-arid. The fortunes of Pasaje are tied to a narrow canal from the moist woodland and a tiny brook from a hollow in the valley wall. Where the water has thus been brought down to the arable soil of the fans there are rich plantations and farms. Elsewhere, however, the floor is quite dry and uncultivated. In small spots here and there is a little seepage, or a few springs, or a mere thread of water that will not support a plantation, wherefore there have come into existence the valley herdsmen and shepherds. Their intimate knowledge of the moist places is their capital, quite as much as the cattle and sheep they own. In a sense their lands are the neglected crumbs from the rich man's table. So we find the shepherd from the hills invading the valleys just as the valley farmer has invaded the country of the shepherd.

The basin type of topography calls into existence a set of relations quite distinct from either of those we have just described. Figure 11 represents the main facts. The rich and comparatively flat floor of the basin supports most of the people. The alluvial fans tributary thereto are composed of fine material on their outer margin and of coarse stony waste at their heads. Hence the valley farms also extend over the edges of the fans, while only pasture or dense chaparral occupies the upper portions. Finally there is the steep margin of the basin where the broad and moderate slopes of the highland break down to the floor of the basin.

If a given basin lies at an elevation exceeding 14,000 feet, there will be no cultivation, only pasture. If at 10,000 or 11,000 feet, there will be grain fields below and potato fields above (Figs. 12 and 13). If still lower, fruit will come in and finally sugar cane and many other subtropical products, as at Abancay. Much will also depend upon the amount of available water and the extent of the pasture land all about. Thus the densely populated Cuzco basin has a vast mountain territory tributary to it and is itself within the limits of barley and wheat cultivation. Furthermore there are a number of smaller basins, like the Anta basin on the north, which are dependent upon its better markets and transportation facilities. A dominance of this kind is self-stimulating and at last is out of all proportion to the original differences of nature. Cuzco has also profited as the gateway to the great northeastern valley region of the Urubamba and its big tributaries. All of the varied products of the subtropical valleys find their immediate market at Cuzco.

The effect of this natural conspiracy of conditions has been to place the historic city of Cuzco in a position of extraordinary importance. Hundreds of years before the Spanish Conquest it was a center of far-reaching influence, the home of the powerful Inca kings. From it the strong arm of authority and conquest was extended; to it came tribute of grain, wool, and gold. To one accustomed to look at such great consequences as having at least some ultimate connection with the earth, the situation of Cuzco would be expected to have some unique features. With the glorious past of that city in mind, no one can climb to the surrounding heights and look down upon the fertile mountain-rimmed plain as at an ordinary sight. The secret of those great conquests lies not only in mind but in matter. If the rise of the Incas to power was not related to the topography and climate of the Cuzco basin, at least it is certain that without so broad and noble a stage the scenes would have been enacted on a far different scale.

The first Inca king and the Spanish after the Incas found here no mobile nomadic tribes melting away at the first touch, no savages hiding in forest fastnesses, but a well-rooted agricultural race in whose center a large city had grown up. Without a city and a fertile tributary plain no strong system of government could be maintained or could even arise. It is a great advantage in ruling to have subjects that can not move. The agricultural Indians of the Andean valleys and basins, in contrast to the mobile shepherd, are as fixed as the soil from which they draw their life.

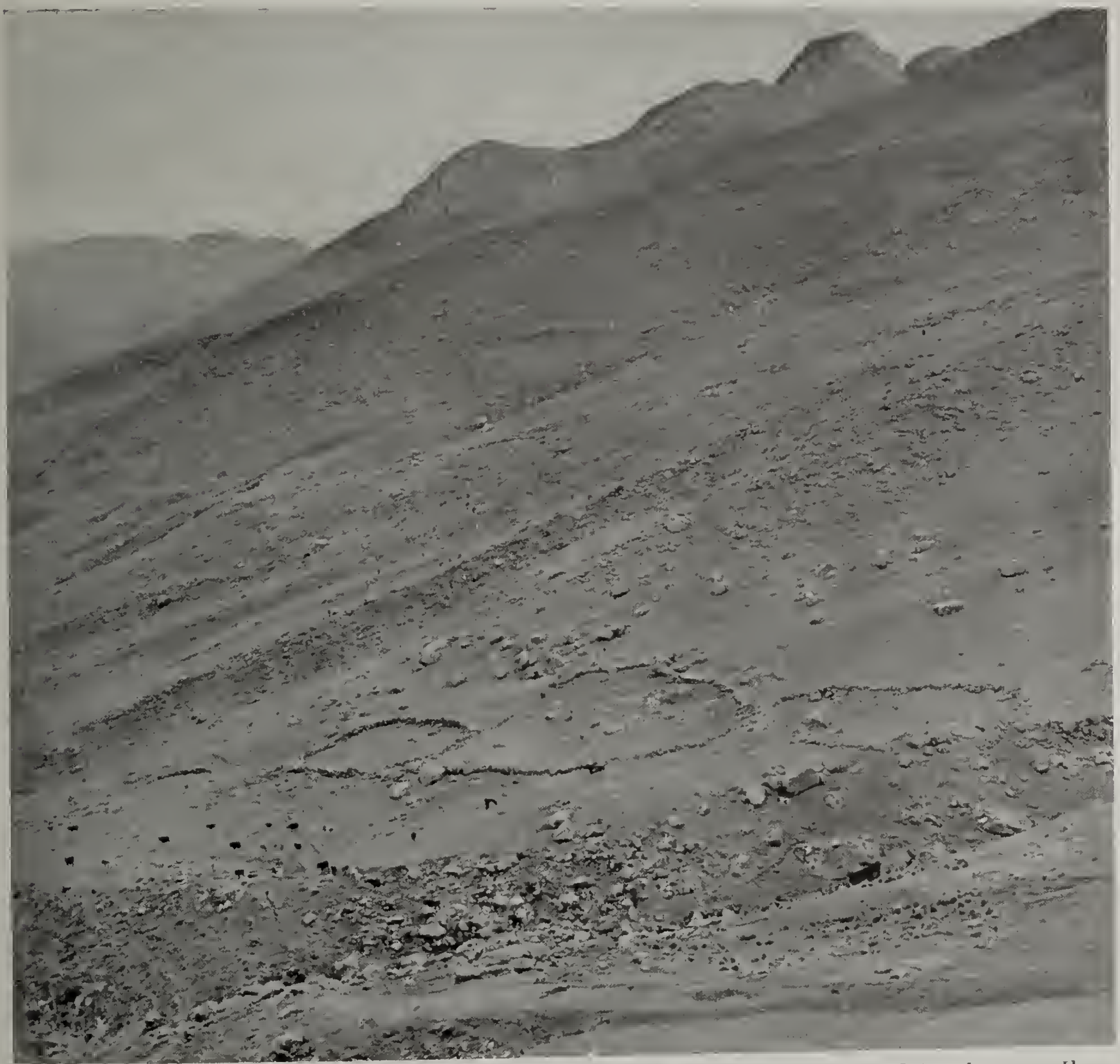

FIG. 16—Alpine pastures in the mountain valley, between Chuquibambilla and Lambrama. Huge stone corrals are built on either slope, sheltered from the night winds that blow down-valley.

The full occupation of the pasture lands about the Cuzco basin is in direct relation to the advantages we have already enumerated. Every part of the region feels the pressure of population. Nowhere else in the Peruvian Andes are the limits between cultivation and grazing more definitely drawn than here. Moreover, there is today a marked difference between the types that inhabit highland and basin. The basin Indian is either a debauched city dweller or, as generally, a relatively alert farmer.

The shepherds are exceedingly ignorant and live for the most part in a manner almost as primitive as at the time of the Conquest. They are shy and suspicious. Many of them prefer a life of isolation and rarely go down to the town. They live on the fringe of culture. The new elements of their life have come to them solely by accident and by what might be called an ethnic process of seepage. The slight advances that have been made do not happen by design, they merely happen. Put the highland shepherd in the basin and he would starve in competition with the basin type. Undoubtedly he would live in the basin if he could. He has not been driven out of the basin; he is kept out.

And thus it is around the border of the Abancay basin and others like it. Only, the Abancay basin is lower and more varied as to resources. The Indian is here in competition with the capitalistic white planter. He lives on the land by sufferance alone. Farther up the slopes are the farms of the Indians and above them are the pastures of the ignorant shepherds. Whereas the Indian farmer who raises potatoes clings chiefly to the edge of the Cuzco basin where lie the most undesirable agricultural lands, the Indian farmers of Abancay live on broad rolling slopes like those near the pass northward toward Huancarama. They are unusually prosperous, with fields so well cultivated and fenced, so clean and productive, that they remind one somewhat of the beautiful rolling prairies of Iowa.

It remains to consider the special topographic features of the mountain environments we are discussing, in the Vilcapampa region on the eastern border of the Andes (Fig. 14). The Cordillera Vilcapampa is snow-crested, containing a number of fine white peaks like Salcantay, Soray, and Soiroccocha (Fig. 2). There are a large number of small glaciers and a few that are several miles long. There was here in glacial times a much larger system of glaciers which lived long enough to work great changes in the topography. The floors of the glaciated valleys were smoothed and broadened and their gradients flattened (Fig. 15). The side walls were steepened and precipitous cirques were formed at the valley heads. Also, there were built across the valleys a number of stony morainic ridges. With all these changes there was, however, but little effect upon the main masses of the big intervalley spurs. They remain as before—bold, wind-swept, broken, and nearly inaccessible.

The work of the glaciers aids the mountain people. The stony moraines afford them handy sizable building material for their stone huts and their numerous corrals. The thick tufts of grass in the marshy spots in the overdeepened parts of the valleys furnish them with grass for their thatched roofs. And, most important of all, the flat valley floors have the best pasture in the whole mountain region. There is plenty of water. There is seclusion, and, if a wall be built from one valley wall to another, an entire section of the valley may be enclosed, and with little labor. A village like Choquetira, located on a bench on the valley side, commands an extensive

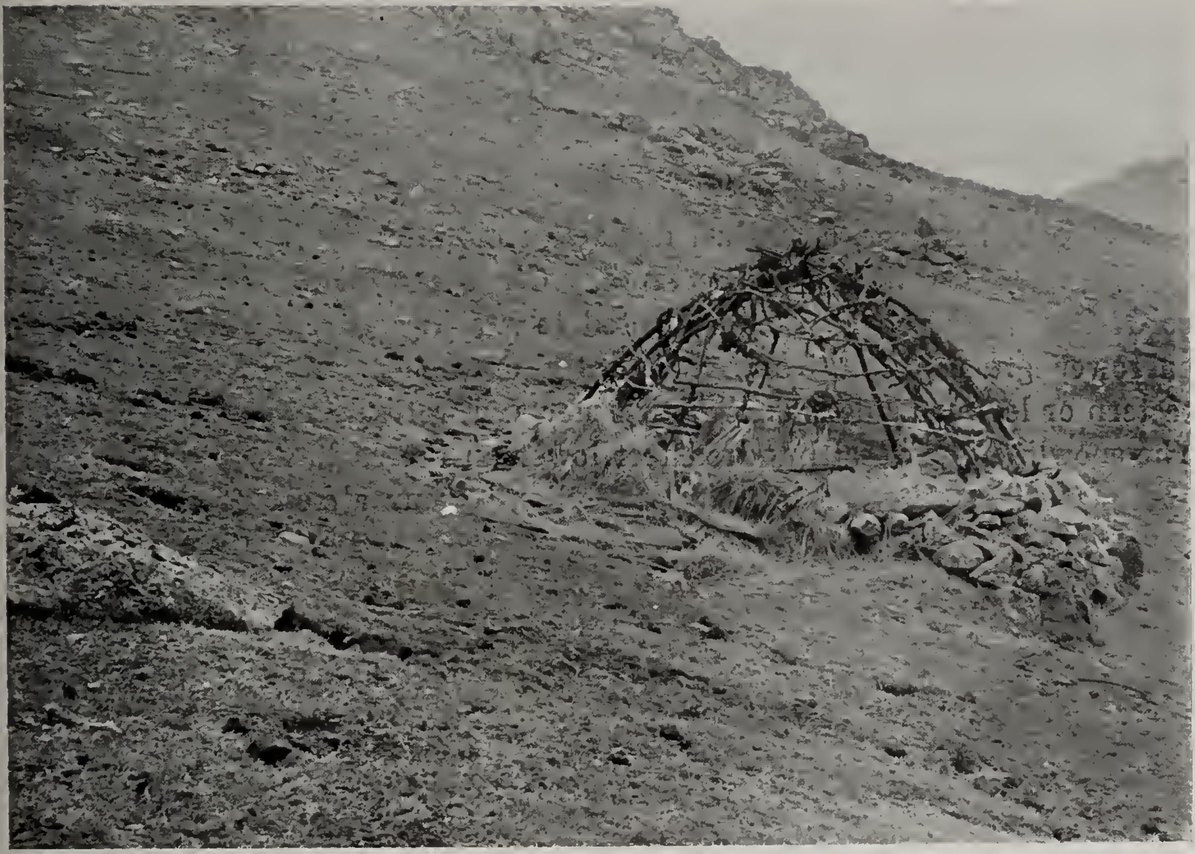

FIG. 17.

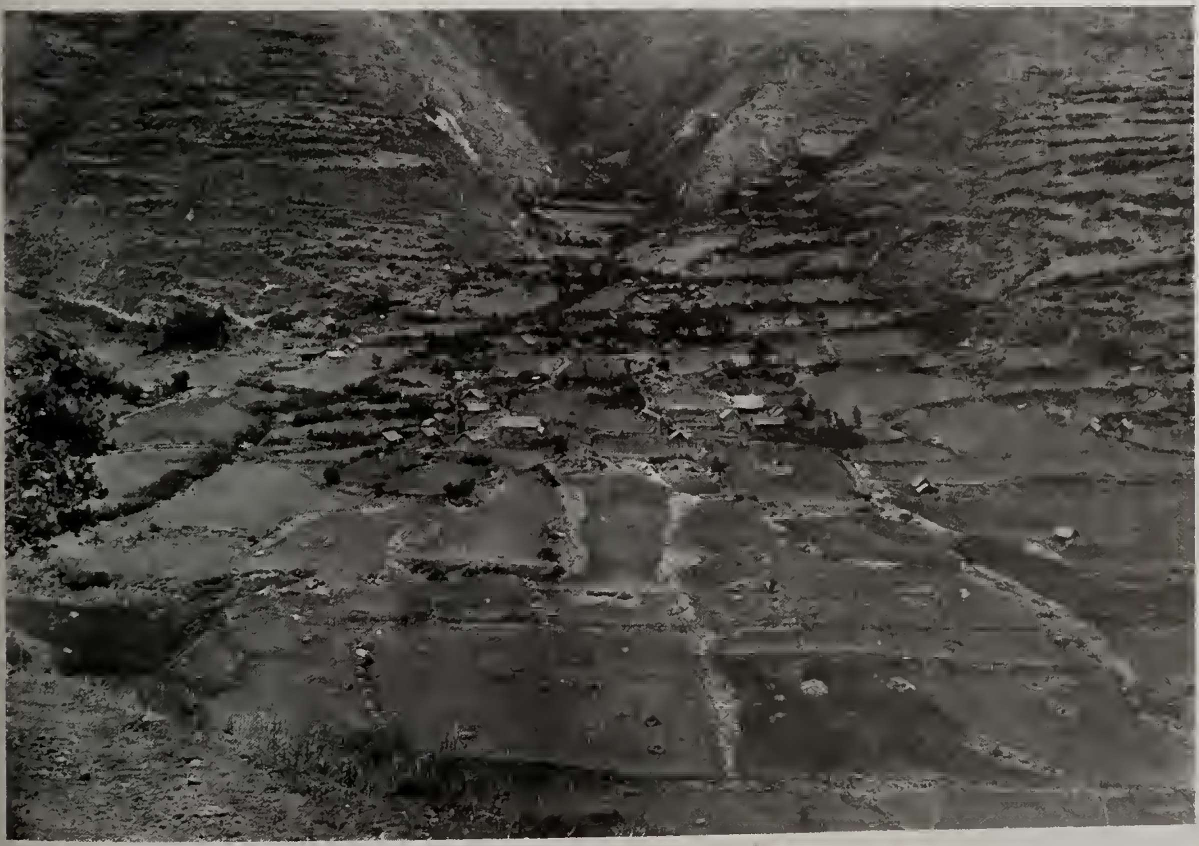

FIG. 18.

FIG. 17—Shepherds' shelter hut near Chuquibambilla. Elevation just under 16,000 feet. Contrast with Fig. 16 and Fig. 5.

FIG. 18—Village at head of alluvial fan near Lambrama. This relation of town to alluvial fan is typical of a large part of the Peruvian Andes. Above are the mountain pastures; below are the better farms of the valley and basin planters. See Fig. 16 for the grazing country. Elevation 10,600 feet.

view up and down the valley—an important feature in a grazing village where the corrals can not always be built near the houses of the owners. Long, finger-like belts of highland-shepherd population have thus been extended into the mountain valleys. Sheep and llamas drift right up to the snowline (Figs. 15 and 16).

There is, however, a marked difference between the people on opposite sides of the Cordillera Vilcapampa. On the west the mountains are bordered by a broad highland devoted to grazing. On the east there is a narrower grazing belt leading abruptly down to tropical valleys. The eastern or leeward side is also the warmer and wetter side of the Cordillera. The snowline is several hundred feet lower on the east. The result is that patches of scrub and even a little woodland occur almost at the snowline in favored places. Mist and storms are more frequent. The grass is longer and fresher. Vegetation in general is more abundant. The people make less of wool than of cattle, horses, and mules. Vilcabamba pueblo is famous for its horses, wiry, long-haired little beasts, as hardy as Shetland ponies. We found cattle grazing only five hundred feet below the limit of perpetual snow. There are cultivated spots only a little farther down, and only a thousand feet below the snow are abandoned terraces. At the same elevation are twisted ghenigo trees, at least two hundred years old, as shown by their rings of growth. Thus the limits of agriculture are higher on the east; likewise the limits of cattle grazing that naturally goes with agriculture. Sheep would thrive, but llamas do better in drier country, and the shepherd must needs mix his flocks, for the wool which is his chief product requires transportation and only the cheap and acclimated llama is at the shepherd's disposal. From these facts it will be seen that the anthropogeographic contrasts between the eastern and western sides of the Cordillera Vilcapampa are as definite as the climatic and vegetal contrasts. This is especially well shown in the difference between dry Arma, deep-sunk in a glaciated valley west of the crest of the mountains, and wet Puquiura, a half-day's journey east of the crest. There is no group on the east at all comparable to the shepherds of Choquetira, either in the matter of thoroughgoing dependence upon grazing or in that of dependence upon glacial topography.

Topography is not always so intimately related to the life of the people as here. In our own country the distribution of available water is a far greater factor. The Peruvian Andes therefore occupy a distinctive place in geography, since, more nearly than in most mountains, their physical conditions have typical human relations that enable one clearly to distinguish the limits of control of each feature of climate or relief.

The emphasis has been kept upon topographic controls, though it has not always been possible or desirable to detach these from their intimate associations with the leading climatic factors of temperature and rainfall.

PLAINS, PLANES, AND PENEPLANES

By DOUGLAS WILSON JOHNSON

Among the landforms which geographers have occasion frequently to describe, none suffers more from the unsatisfactory condition of geographic terminology than do the various types of plains of deposition and plains of erosion. When we realize that the term "coastal plain" is used to denote two features of such dissimilar origin as an uplifted series of seabottom deposits and a rock-cut terrace produced by marine abrasion, and that no names have been consistently applied to almost-plane surfaces of marine and aeolian denudation, it must appear desirable to give some attention to the terminology of these all-important forms.

In addition to plains composed of comparatively undisturbed and therefore approximately horizontal stratified rocks, we must recognize (1) the perfectly plane surfaces of ultimate erosion and (2) the imperfect, "almost-plane" surfaces which characterize the penultimate stages of the several erosion cycles. Theoretically there may be three, or possibly four, planes of completed erosion, with a corresponding number of almost-plane surfaces of uncompleted erosion, due to the action of rivers, waves, winds, and possibly glaciers.

Davis has given the name "peneplain" to the almost-plane surface of uncompleted fluvial denudation. The other almost-plane surfaces remain unnamed, except that such terms as "plain of marine denudation," "plain of marine abrasion," and "plain of aeolian erosion" have been applied to erosion surfaces, usually without regard to whether they were really plane surfaces or only surfaces of moderate relief. An exception to the foregoing statement is perhaps to be found in Gulliver's valuable paper on "Shoreline Topography," where he seems to call the almost-plane surface of marine erosion a "submarine platform," although he makes it identical with "plain of marine denudation" and would therefore seem to have no name for a perfectly plane surface of marine denudation.[1] It does not seem advisable to apply the adjective "submarine" to a surface which is today far above sea level; so some other name should be sought for uplifted surfaces of marine erosion.

It is coming to be recognized that some of the so-called peneplains are more probably almost-plane surfaces of marine erosion, as was, indeed, the opinion of the earlier geologists. Barrell[2] has even questioned the subaerial origin of the New England uplands, supposedly a typical peneplain, and the one above which rises the mountain selected as the type "monadnock." Should his conclusions prove correct and apply to the portion of the supposed peneplain in southern New Hampshire, then not only would the upland cease to merit the term "peneplain," but Mt. Monadnock would no longer be a "monadnock," as that term is generally defined. We would have to change the definition of monadnock or invent a new name for the topographic feature of which it is an example.

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[1] F. P. Gulliver: Shoreline Topography, *Proc. Amer. Acad. Arts and Sciences*, Vol. 34, 1899, pp. 176-177.

[2] Joseph Barrell: Piedmont Terraces of the Northern Appalachians and Their Mode of Origin, *Bull. Geol. Soc. Amer.*, Vol. 24, 1913, p. 690.

It appears, therefore, that we need names for the different types of erosion surfaces, which theoretically may be produced, both in the penultimate and the ultimate stages of erosion; that we also need a name for the actually existing upland surfaces of erosion which are so abundant in different parts of the world but of whose origin we are not yet certain; and, finally, that we need a clearer distinction in the names themselves, between "plains" of erosion, "plains" of deposition, and "peneplains." The writer believes it is possible to meet all these needs without departing unduly from the path of conservatism; and to this end the following usage is suggested: (1) The level erosion surface produced in the ultimate stage of any cycle may be called a *plane*. (2) The undulating erosion surface of moderate relief produced in the penultimate stage of any cycle may be called a *peneplane*. (3) A low-relief region of horizontal rocks would, as now, be called a *plain*. We should then recognize planes of fluvial,[3] marine, aeolian, and glacial denudation; also fluvial peneplanes, marine peneplanes, aeolian peneplanes, and glacial peneplanes. A monadnock would be defined as an erosion remnant left standing above a peneplane of any origin, either because it is composed of more resistant rock or because it has been less exposed to the agents of erosion. Vogt[4] has already used the term "Monadnock-Berge" for isolated hills on the uplifted marine abrasion plane of northern Norway. It seems desirable to employ a special term for a surface of marine denudation which is still in its original position at or near wave base, with the marine forces still operating on it, and for this feature the name "abrasion platform" has already been used. An uplifted abrasion platform of large areal extent is a marine peneplane or a marine plane, according to the smoothness of the surface produced by wave erosion.

The advantages of the suggested usage are obvious. It tends to simplify, not to complicate physiographic terminology. The origin of any of the level or almost-level surfaces here discussed is at once apparent from the spelling. If one uses the otherwise noncommittal term "marine plain" in the manner here suggested, the reader knows at once that a plain of marine sediments is referred to; while "marine plane" indicates a wave-cut plane surface. When we remember that both of these forms have been called "marine plains," the advantage of the distinction in spelling is evident. One of our ablest physiographers has applied to a wave-cut rock bench along the coast, the term "coastal plain." Had he written "coastal plane," his meaning at least would have been clear, even though the term as a whole might still be criticized. A peneplain is not "almost a plain" of horizontal sediments but is almost a plane surface in the mathematical sense of the term; therefore "peneplane" more clearly expresses the true meaning of the term than does the older and commoner spelling. So standard a text as Dana's "Manual of Geology"[5] employs the spelling "peneplane;" while J. W. Gregory in his recent book on "The Nature and Origin of Fiords,"[6] makes use of the same form. Lawson has employed both spellings, the form "peneplane" occurring in his "Post-Pliocene Diastrophism of the Coast of Southern California."[7] It may be, also, that the combination of "plane" with "pene-" will seem less objectionable to those who dislike hybrid terms, since "plane" is closer to the original Latin form than "plain."

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[3] "Subaerial" denudation was long used for "fluvial" denudation, because of the prevalent idea that there were only two important types of denudation, subaerial and submarine. Since the importance of aeolian denudation, which is also subaerial, has been recognized, it is desirable to distinguish the two types of subaerial denudation by the terms "fluvial" and "aeolian."

[4] J. H. L. Vogt: Über die schräge Senkung und die spätere schräge Hebung des Landes im nördlichen Norwegen, *Norsk Geologisk Tidsskrift*, Vol. 1, 1907, p. 17.

Davis' introduction of "peneplain" into the vocabulary of physiography in 1889[8] was a valuable service to the science; for it led to a speedy and worldwide recognition of a conception which had previously been announced but which did not become current until well named. It should be appreciated, however, that at this time the idea of subaerial denudation was supplanting, rather than supplementing, the idea of marine denudation. The general attitude was well expressed by De Lapparent in the words: "La notion des pénéplaines est extrêmement féconde, et ce n'est pas un de ses moindres mérites d'avoir porté le coup de grâce à la théorie des plaines de dénudation marine, si fort en honneur de l'autre côté du détroit."[9] Davis himself regarded extensive planes of marine denudation as "very improbable,"[10] while planes of glacial or aeolian denudation were as yet scarcely considered. All planes of penultimate stages of erosion were called "peneplains" because it was believed that they were all formed essentially by subaerial agencies. No need was felt of names for almost-plane surfaces of marine and other types of erosion, since the existence of such planes was either considered improbable or was not considered at all.

Later years have witnessed the publication of Passarge's studies of surfaces of aeolian denudation,[11] and the probability of the existence of fairly extensive surfaces of marine denudation seems now to be recognized by Davis and others.[12] We are confronted with the fact that there are numerous almost-plane erosion surfaces in various parts of the world, the origin of which is in most cases doubtful and in many cases will probably never be known because nearly all of the upland has been destroyed by subsequent stream erosion. As Davis once remarked, "It must be remembered that the terms 'plain of marine denudation' and 'peneplain' are in nearly all cases hardly more than different names for the same thing. If the whole truth were known, it is probable that one or the other name might be appropriately applied in this or that case, but it is seldom that anyone has succeeded in convincing all his contemporaries that he could distinguish a plain of marine denudation from a peneplain, or vice versa."[13] Present needs can better be met by applying the excellent term "peneplane" to all these surfaces and qualifying the term by the word fluvial, marine, aeolian, or glacial in case it can be shown that a given surface is of the origin indicated by the qualifier, rather than by inventing a new term for almost-plane erosion surfaces of doubtful origin. Peneplane is too valuable a term and is too extensively used to have it restricted to the very few (if any) erosion surfaces demonstrably of fluvial origin; and, since the wise physiographer avoids a name which commits him unwillingly to a certain theory of origin, it seems best in the present case to extend the meaning of the term.

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[5] J. D. Dana: Manual of Geology, 4th edit., 1895, p. 204.

[6] J. W. Gregory: The Nature and Origin of Fiords, London, 1913, p. 195.

[7] A. C. Lawson: The Post-Pliocene Diastrophism of the Coast of Southern California, *Bull. Univ. of California Dept. Geology*, Vol. 1, 1893, p. 158.

[8] W. M. Davis: Topographic Development of the Triassic Formation of the Connecticut Valley, *Amer. Journ. Sci.*, 3rd Ser., Vol. 37, 1889, p. 430.

[9] La geomorphogénie, *Rev. des Quest. Scient.*, 1895.

[10] W. M. Davis: Geographical Essays, edited by Douglas W. Johnson, Boston, 1909, p. 291.

[11] Siegfried Passarge: Die Kalahari, 822 pp., Berlin, 1904; Rumpffläche und Inselberge. *Zeitschr. Deutsch. Geol. Gesell.*, Vol. 56, 1904, Protokoll, pp. 193-209; Die Inselberglandschaften im tropischen Afrika, *Naturwiss. Wochenschr.*, N. S., Vol. 3, 1904, pp. 657-665.

While it is true that the writer is advocating a broader significance for "peneplane" than is usually given to it, precedent for such usage is not altogether lacking. H. E. Gregory is responsible for using the term as synonymous with "plain of denudation . . . . carved out of other landforms either by the action of the forces that work on the land or by the waves of the sea."[14] Davis himself has occasionally employed the term in the broader sense. Thus, in an account of the geographic development of northern New Jersey, he discusses at length "whether the old Highland peneplain was the product of subaerial or submarine processes."[15] He distinguishes between "subaerial baselevel plain" and "submarine platform" but applies the name "peneplain" to the topographic feature itself, while its origin remains in doubt. In a discussion of the arid cycle by the same author,[16] "peneplains" are usually contrasted with true "plains" of aeolian erosion; but the frequent use of the expression "normal peneplain" and the application of the term "monadnock" to residuals on a plane of aeolian denudation suggest that the author at least unconsciously recognized the possible existence of peneplanes which were not formed by "normal" (stream) erosion. Marine peneplanes are more definitely recognized, at least as a theoretical possibility requiring discussion, when in an essay on planes of marine and subaerial denudation the author says: "By whatever process the so-called 'plain of denudation' was produced, an explanation that will account for a peneplain of moderate or slight relief is all that is necessary."[17]

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[12] W. M. Davis: Meandering Valleys and Underfit Rivers, *Annals Assoc. Amer. Geogrs.*, Vol. 3, 1913, p. 27. *Idem, op. cit.* sub 10, p. 374.
Joseph Barrell: *op. cit.*, p. 690.

[13] *Op. cit.* sub 10, p. 374.

[14] H. E. Gregory, A. G. Keller, and A. L. Bishop: Physical and Commercial Geography, Boston, 1910, p. 46.

[15] W. M. Davis and J. W. Wood: The Geographic Development of Northern New Jersey, *Proc. Bost. Soc. Nat. Hist.*, Vol. 24, 1890, p. 374.

[16] *Op. cit.* sub 10, pp. 276-322.

It appears, therefore, that many considerations of weight favor a more general adoption of the spelling "peneplane" and the employment of the term to designate almost-plane surfaces produced in the penultimate stage of any erosion cycle. Should these considerations, as set forth above, commend themselves favorably to others, the writer suggests that they adopt the usage advocated and thereby assist in simplifying and clarifying physiographic terminology. Every extension of this usage, already established in certain quarters, will serve to render more precise the important conceptions for which the words plain and peneplane now stand.

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[17] *Ibid.*, p. 340.

THE NON-EXISTENCE OF PEARY CHANNEL

Three years ago, Knud Rasmussen, the well-known Danish explorer, gave a preliminary account of his latest surveys in northern Greenland.[1] The results were of unusual interest because they not only connected up the work of Peary and Mylius Erichsen but corrected certain errors in the geography of northern Greenland that had persisted since Peary's first exploration of that coast in 1892.

There has just been received at the library of this Society Rasmussen's final report,[2] and geographers in this country should have great interest in it as setting straight at last a long-disputed point in Arctic geography. A review of Rasmussen's report will be published in the next number. Only the bearing of his surveys on Peary Channel will be considered in this note.

On the American expedition led by General A. W. Greely in 1881-1884, which formed part of an international co-operative undertaking to study Arctic conditions, the north coast of Greenland was surveyed by Lieut. J. B. Lockwood northeastward as far as Cape Washington (see map, Fig. 1). A reference to the map of these surveys[3] shows many fiords running toward the interior. The next traverse along this coast was that of Peary in 1900, when he reached Cape Wyckoff, some 150 miles beyond Lockwood's farthest.[4] It was on his earlier expeditions of 1892 and 1895 across the ice-cap of northern Greenland that Peary reported[5] the existence of a transverse channel which was supposed to mark the limits of Greenland on the north and establish its insularity. The channel was supposed to emerge at Nordenskiöld Inlet on the northwest. The official chart of the region by the U. S. Hydrographic Office[6] incorporates this feature and designates it "Peary Channel"; likewise many other charts and maps, including the large standard map of Greenland published in Denmark in 1906.[7]

The reported discovery was challenged from the first. Peary's companion, Astrup,[8] asserted the unbroken extension of Greenland far north of Navy Cliff, perhaps the most critical observation point in their journey for the determination of a cross channel, and so represented it on his map. Rabot[9] reviewed the discussion in 1894, asserting his faith in Astrup's contention, but in this country Rabot's conclusions were discredited.[10] And the government maps until within a few years gave the weight of official sanction. Astrup's first report is now proven to have been correct. First came Mylius Erichsen in 1906-1908, exploring the northeastern coast to the head of Independence Bay.[11] He died from cold and starvation in 1907 but left a report in a stone cairn that established the fiord-like character of Independence Bay and the non-existence of Peary Channel.[12] In 1909-1912 Mikkelsen conducted a search expedition to the region, found Erichsen's record and to some degree extended his work.[13] Koch, of the Mylius-Erichsen expedition, in 1907 carried his surveys far northward to Cape Bridgman, thus connecting with Peary's coastal surveys of 1900.[14] Rasmussen, also searching for Erichsen, in 1912, found no record of Mikkelsen, owing to the latter's neglect to leave a report in the cairn from which he took Erichsen's last message.[15] Anxious to settle the channel problem Rasmussen skirted Mylius Erichsen Land and adjacent lands, crossed and went to the head of Independence Fiord and actually traced the land connection of so-called Peary Land with Greenland. To Erichsen belongs the credit of proving Peary Channel non-existent, to Rasmussen the credit of mapping it, and to Koch the credit of mapping the last corner of northeastern Greenland that was unknown until then (1907).

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[1] *Geogr. Journ.*, Vol. 41, 1913, pp. 593-594 (abstracted in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 618); *La Géogr.*, Vol. 27, 1913, pp. 375-377.

[2] Knud Rasmussen: Report of the First Thule Expedition, 1912, *Meddelelser om Grønland*, Vol. 65, No. 8 (= pp. 285-340), 1915, with map, 1:1,300,000, by Peter Freuchen, of the connection between Peary Land and the mainland of Greenland. See also the other reports on the expedition in the same volume, designated Nos. 9 to 13, inclusive, especially Peter Freuchen: General Observations as to Natural Conditions in the Country Traversed by the Expedition, No. 9 (= pp. 343-370).

[3] Chart of Coast of North Greenland, 1:900,000 facing p. 186 of Vol. 1 of "Report on the Proceedings of the United States Expedition to Lady Franklin Bay, Grinnell Land," by A. W. Greely, 2 vols., Washington, 1888.

[4] Report of R. E. Peary, C.E., U. S. N., on Work Done in the Arctic in 1898-1902, with map, 1:3,168,000, *Bull. Amer. Geogr. Soc.*, Vol. 25, 1903, pp. 496-534; reference on pp. 517-520.

[5] R. E. Peary: The North Greenland Expedition of 1891-92, *Journ. Amer. Geogr. Soc.*, Vol. 24, 1892, pp. 536-558; reference on p. 555 under (3): "the existence of detached ice-free land . . . to the northward."

Cyrus C. Adams: Lieutenant Peary's Arctic Work, *Geogr. Journ.*, Vol. 2, 1893, pp. 303-316, with map, 1:3,000,000; references on pp. 310-311 and on the map, which shows the transverse channel.

R. E. Peary: Northward Over the "Great Ice," 2 vols., Stokes, New York, 1898; reference in Vol. 1, pp. 345-346 *et al.*

[6] Baffin Bay to Lincoln Sea, Polar Regions, showing the recent discoveries by Civil Engineer R. E. Peary, U. S. N., . . . 1:1,400,000. Chart No. 2142, 1903.

[7] Kort over Grönland, udgivet af Commissionen for Ledelsen af de geologiske og geographiske Undersögelser i Grönland. 1:2,000,000. Copenhagen, 1906.

[8] Eivind Astrup: Løitnant Peary's Grønlandsekspedition, 1891-92, *Det Norske Geogr. Selskabs Årbog*, Vol. 4, 1892-93, pp. 25-44, with map of northern Greenland, 1:6,000,000; reference on p. 43.

In Astrup's subsequent book, "With Peary Near the Pole" (transl. from the Norwegian by H. J. Bull, Lippincott, Philadelphia, 1898), he modified his first view and favored the channel theory both in the text (pp. 227-228) and on the map.

The final question is, What physical conditions led Peary to believe in a channel when an upland and high relief actually exist? With rare delicacy an explanation has been framed by Rasmussen himself. In Peary's cairn at Navy Cliff Rasmussen found Peary's now well-known letter dated July 5, 1892, recording his arrival at Independence Fiord. The letter makes no mention of the discovery of Peary Channel, and on this Rasmussen comments as follows:[16] "As will be seen from the above, Admiral Peary makes no mention here of any channel, and even calls the place Independence Fjord. It must therefore have been at a later date that the idea arose as to a channel between North Greenland and Peary Land. In any case, it is found marked on all American maps under the name of Peary Channel. It is also impossible to see the base of the fjord from the point on Navy Cliff where the cairn was built: all that can be seen is that the ice from the fjord runs farther on inland. This, with the fact that a hollow runs through Valmuedalen over towards Nordenskjöld's Inlet on the west, explains how the theory originated."

Neither the maps nor the charts based on data furnished by Peary show Peary Channel as a surveyed but only as a probable connection between Nordenskiöld Inlet on the west and Independence Fiord on the east. On the other hand Peary's account

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[9] Charles Rabot: Les récentes explorations arctiques, *Compte Rendu des Séances de la Soc. de Géogr.* [*de Paris*], 1894, pp. 428-437; reference on p. 433.

[10] *Journ. Amer. Geogr. Soc.*, Vol. 27, 1895, pp. 60-62.

[11] Cf. A. Trolle: The Danish North-East Greenland Expedition, *Geogr. Journ.*, Vol. 33, 1909, pp. 40-65, with map, 1:4,000,000.

Achton Friis: Im Grönlandeis mit Mylius Erichsen. German translation from the Danish by F. Stichert. 2nd. edit. Spamer, Leipzig, 1913.

G. Amdrup: Report on the *Danmark* Expedition to the North-East Coast of Greenland, 1906-1908, *Meddelelser om Grønland*, Vol. 41, No. 1 (=pp. 1-270), 1913, with map of northeastern Greenland, 1:2,000,000, Pl. II. [The official report.]

[12] G. C. Amdrup: Mylius-Erichsen's Report on the Non-Existence of the Peary Channel: Information Brought Home by Ejnar Mikkelsen, *Meddelelser om Grønland*, Vol. 41, No. 5 (=pp. 471-474), 1913.

[13] Einar Mikkelsen: Expedition to North-East Greenland, 1902-12, *Geogr. Journ.*, Vol. 41, 1913, pp. 313-324, with map, 1:4,000,000.

Ejnar Mikkelsen: Lost in the Arctic, Doran, New York, 1913, with map, 1:2,000,000.

[14] *Op. cit.* in footnote 11, third entry, pp. 124-135.

[15] *Op. cit.* in footnote 2, p. 317.

[16] *Ibid.*, p. 326

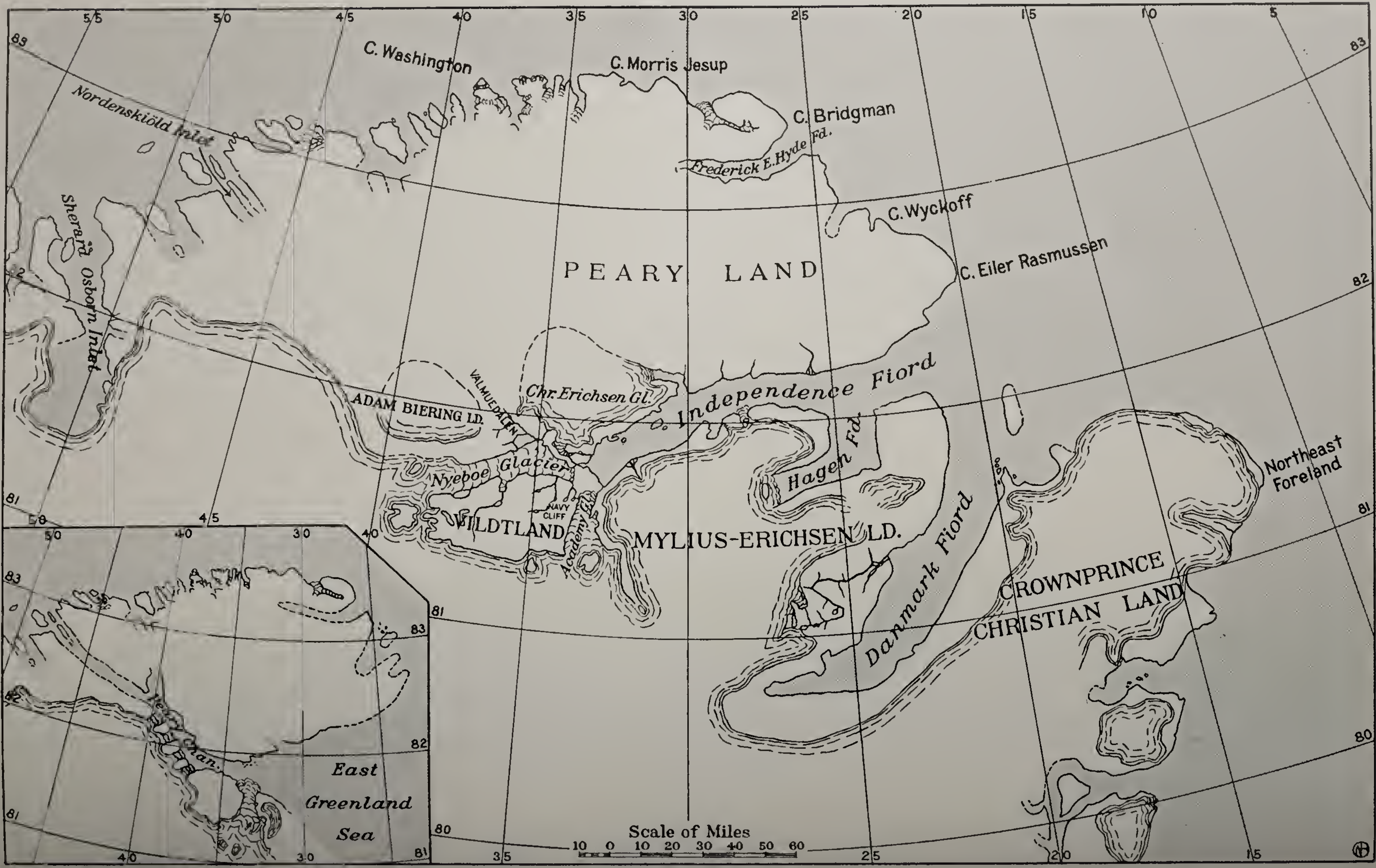

FIG. 1—Sketch map of northernmost Greenland according to present knowledge, based on the surveys of the Greely (1882), Peary (1892 and 1900), Mylius

of the ''fiord,'' later called ''channel,'' and his conclusion regarding it are positive and clear, though carried to lengths not warranted by his observations. In ''Northward Over the 'Great Ice,' '' page 317, and again on page 318, a fiord is mentioned near the northern end of Peary's inward march. The most significant passages occur later. ''Looking to the west [from Navy Cliff, see map, Fig. 1], we saw the opening of the fjord [later known as Peary Channel] that had barred our northern advance. . . . Now we knew that we had paralleled its course across the northern end of the mainland from Robeson Channel clear to the Arctic Ocean off the shores of north-east Greenland. For days we had kept constantly in view the mountain masses forming the southern boundary of this channel, and through rifts in the mountains we had from time to time seen this depression, and had now and then caught glimpses of the frozen channel occupying it; and we had seen beyond it mountains and fjords stretching between them. It was evident that this channel marked the northern boundary of the mainland of Greenland'' (pp. 345-346). . . . ''There is every reason to believe that to the north-west, north, and north-east we were gazing upon an archipelago whose western limits Lockwood had discovered in 1882'' (p. 347). A deep fiord may enter from the west along the line of the supposed Peary Channel. For the rest, as above quoted, the conclusion rested upon ''glimpses,'' ''from time to time,'' ''through rifts,'' ''in [distant] mountains,'' of what was supposed to be a channel or fiord. Glaciers of low gradient may under such circumstances have been mistaken for an ice-coated fiord. Nyeboe Glacier lies approximately in the line of continuation of Independence Fiord and Peary Channel. On the other hand, Rasmussen thinks that the Valmuedalen depression may have been mistaken for a channel.

Thus in the long progress of charting the world's coasts some things are ''put on the map,'' to be taken off again as detailed surveys take the place of reconnaissance journeys and actual traverses and maps are substituted for sketches and hypotheses based on distant views. But we should be careful to give proper credit to the pioneer in any region, even if the pioneer sometimes draws too large and dramatic a conclusion from a small, though valuable, body of fact.

When an error is discovered an explorer's critics seldom take the trouble to look for extenuating facts. We have called attention to several in the paragraph above. There is one which is still more important. Greenland is in general a high plateau, a vast ice-coated carapace. Nansen, De Quervain, Koch, Rasmussen, and Peary are all agreed as to its topographic character. Koch found mountains reaching above 9,500 feet in latitude 72°, but that is quite exceptional. At the border the ice sheet exhibits a zone of transition where valley glaciers alternate with rugged forelands. The visible *relief* of the island is greatest at its border. The northern end of Greenland appears to be exceptional in this respect. Its physiography is distinct. Instead of a dome-shaped plateau covered with ice it appears to be a mountainous region with deep valleys filled with and scoured by ice and thus transformed into peaks, uplands, and glacial troughs. Peary knew the west and north coasts well. When in his journey of 1892 he reached the northern limit of the main ice sheet, the *inlandeis,* as it is termed, and saw before him mountains separated by deep valleys, it was altogether natural for him to suppose that he was near the limits of the northern coast. The deep glacier-filled valleys at a distance looked like fiords. Further exploration of the region would now be desirable; in fact Mikkelsen planned both to explore and to survey the land along the supposed channel in 1910,[17] but learning through Mylius Erichsen's report of the non-existence of the channel was obliged to turn back. It appears that the local ice fields of ''Peary Land'' are separated from the main Greenland cap, along the line of the now disproved ''Peary Channel,'' by a belt of rugged country. Lieut A. Trolle reported[18] that

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[17] *Op. cit.* in footnote 13, first entry, p. 317.

[18] *Op. cit.* in footnote 11, first entry, p. 52.

Peary Land is not covered with inland ice and that it has mountains up to 2,000 feet in height—facts based on the report of Koch, topographer of the Mylius-Erichsen Expedition. Peary discovered some quite remarkable physiographic features, a fact we should not forget in noting corrections in his interpretation of them. Also he made a sledge journey across Greenland which up to that time had no equal in polar exploration.

THE AFRICAN COLONIES OF GERMANY AND THE WAR

As a part of the military operations of the war, the four African colonies of Germany were attacked by the Allies. Three, German Southwest Africa, Kamerun, and Togo, have been conquered, while in German East Africa fighting is still going on. Their ultimate fate depends upon the final issue of the war. These colonies[1] have a total area of 1,030,150 square miles and are thus a little more than four times as large as Germany. At the beginning of the war, in August, 1914, they had reached a stage of prosperity that bade fair to justify the enormous expenditure of money, if not the appalling loss of life, chiefly native, that had marked their development. They were all in a thriving condition though still in the early stages of their history.

In the management of her colonies, Germany has shown marked limitations as well as superior qualities. In her dealings with the natives, coercion has been the policy, though England, for example, has found it wise as well as humane to use severe measures only when milder methods have failed. The military expenditures have been enormous in all the German colonies excepting Togo. Between 1891 and 1903, Germany sent out twenty-nine punitive expeditions against the Kamerun natives. No other power in Africa has waged such a war against primitive blacks as that which, in two years, nearly exterminated the Hereros (Bantus) of German Southwest Africa. In brief, German administration in the African colonies has very often been too inflexible, rigid, and tactless to meet the condition of natives, most of whom would have been tractable if some degree of deliberation, patience, and kindness had characterized the dealings with them.

In some other respects, however, and chiefly along the lines of scientific development, Germany has excelled all other colonial powers in Africa. She has carried on scientific surveys upon which are based the maps of parts of her large territory—maps that are unsurpassed and rarely equaled by those of any other of the colonial powers. The colony of Togo is the only part of colonial Africa whose detailed topographic map is completed.

When Germany entered the colonial field in 1884 it was generally believed by the other powers that all the more promising parts of Africa had already been appropriated. Germany did not long delay the initiation of a most thorough and scientific investigation of colonial resources and possibilities of development. As the prospects were gradually unfolded Germany, as well as the other powers, were surprised by the revelation of the potential value of all her colonies. German Southwest Africa, chiefly reputed to be a wide zone of worthless sand, was found to be rich in gold, diamonds, and other mineral resources, with wide areas of agricultural and grazing lands in the north, large opportunities for the reclamation of lands in the east by means of irrigation, and a climate that fitted the country to become the home of many thousands of white settlers. When England seized the colony last year she found there some 15,000 German farmers whose homes were surrounded by gardens, fields, and pastures.

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[1] German Southwest Africa, acquired April 24, 1884; Togo, July 2, 1884; Kamerun, July 14, 1884; German East Africa, February 17, 1885.

Germany made her most intensive studies in German East Africa especially to discover the range of agricultural possibilities and the distribution of mineral resources. The Agricultural Department at the capital, Dar-es-Salam, was supplemented by some twenty substations, scattered all over the country, where studies were made of the soils, their adaptation for growing tropical export crops, the varieties of cotton and other plants that were best adapted for each locality, etc. A little back of the northeast coast the Germans developed the cultivation of sisal fiber till their exports bade fair to rival in quantity those of Yucatan. They found gold in the north-central parts of the colony and in the Ruanda highlands of the northwest; and among their other discoveries were two districts, one south of Mount Kilimanjaro and the other in southern Ruanda, which, by reason of their elevation, were well adapted to become the homes of white men. Several hundreds of German, Boer, and Greek farmers and cattle raisers are now settled within view of the loftiest of African mountains on the southern part of the same high plateau that is occupied by British colonists in British East Africa.

The Germans know Togo as well as they do the two colonies referred to above; but Kamerun, in its climate, mountainous topography, and the unfriendly attitude of some of the stronger tribes of the interior, has given Germany its most perplexing colonial problem. All the region directly tributary to the Atlantic border has, however, for years supplied a large amount of rubber, palm oil, and cacao. Though a large part of Togo is covered with forest, the country, as a whole, may be called a great tropical plantation; and though its coast line is only thirty-two miles long, a large amount of palm kernels, oil, rubber, and cotton passes through the one good, open port of Lome, the capital.

The war was scarcely a fortnight old when the Senegalese soldiery of England and the well-trained black infantry of French West Africa, officered by whites, swooped down upon Togo. The little colony was able to offer very little resistance and, on August 26, 1914, was in full possession of the Allies. It was the only easy conquest that the English and French have made in their assaults upon the German colonies. The Germans themselves had no such easy entry into Togo when they annexed it in 1884. The missionaries were opposed to German rule and are said to have been one of the factors in stimulating native resistance which, however, against German guns, was very short-lived; but the populace seem to be taking kindly to the new régime which the Allies have introduced. In 1912, Togo had a foreign trade of over $10,000,000, of which nearly half were exports.

German Southwest Africa was next to fall. General Botha, with a strong force from the Union of South Africa, landed, in January, 1915, at Walfish Bay. By dint of hard fighting, Botha worked his way up the hills towards Windhuk, the capital, building as he advanced a military supply road and guarding his communications with the coast behind him. Meanwhile, large reinforcements for Botha had landed at Lüderitz Bay about 250 miles to the south. They found the new railroad to Keetmanshoop and the north in good order and traveled rapidly on their way till they joined Botha; and the combined forces soon entered Windhuk, where Governor Seitz surrendered all the German forces to the invaders. It was a hard but a short campaign and a complete victory for the British.

German East Africa is undoubtedly the most valuable possession that the Germans acquired in Africa. They were very tardy in building the railroad between Dar-es-Salam and Lake Tanganyika, which now completes a fine avenue for trade between the Indian Ocean and Central Africa. This is the eastern link in the transcontinental line of steam communications, by rail and water, now finished from the Indian to the Atlantic Oceans.[2] The trade of German East Africa was more than trebled in the four years before the war. Its population is about 7,050,000, of whom 3,500 are Germans.

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[2] See note, with map, in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 449-450.

The Germans began the trouble late in September, 1914, by raiding across the border into British East Africa but they were driven back by Indian troops and Arabs from Zanzibar. Then British warships bombarded the capital, Dar-es-Salam, and other towns along the German frontage on the Indian Ocean; and for over a year there has been desultory fighting along the border between British East Africa and German East Africa and recently on Lake Tanganyika; but in no sense have the British so far (May 15) secured effective possession of the German colony.[3]

In the spring of 1915, the British bombarded and captured the Kamerun ports of Victoria and Duala, took possession of Buea, capital of the colony, and drove eastward into the mountains the Germans, who scattered wire entanglements between themselves and the Allies in intervals of fighting. In January, 1916, Jaunde, 200 miles inland, was captured, where the Germans occupied a fortification that they built some years ago as a center for punitive expeditions against disaffected natives. The French also led troops from French Equatorial Africa across eastern Kamerun to meet the British advancing from the Atlantic. The Allies had thus occupied a line extending approximately east and west across central Kamerun; and, late in February, they drove the remnant of the Germans into Spanish Guinea and were at last masters of the colony.

The effect of the war on the whole of colonial Africa has been to kill enterprise of all kinds. Africa is dead today as far as commerce, development, and exploration are concerned. There is no movement whatever on the completed steam route between the Indian Ocean and the mouth of the Congo. South Africa is keeping her newly mined gold and diamonds at home because the risk in sending them to Europe is too great. There is no hope that Africa will recover from the present stagnation till the war is over.

CYRUS C. ADAMS.

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[3] For an account of the military actions in German East Africa see F. R. Cana: Frontiers of German East Africa, *Geogr. Journ.*, Vol. 47, 1916, April, pp. 297-303.

GEOGRAPHICAL RECORD

NORTH AMERICA

Reindeer Experiments in Canada. The preliminary success of Dr. Wilfred Grenfell's reindeer experiments have already been noted in scientific journals. The *Canadian Forestry Journal* now reports (Vol. 12, 1916, pp. 481-482) on the value of a part of the original herd in browsing off hardwood seedlings on evergreen plantations in Quebec. They devour the hardwoods and do not touch the conifers and thus succeed where other methods have failed. On the other hand, the attempt to ''colonize'' the Mackenzie River country at Fort Smith by sending thither a part of the Newfoundland herd has ended in failure. Forty reindeer were placed in a reserved area and left to themselves, but up to a year ago only three were alive. Further experiment is needed, however. The Canadian Northwest has immense reserves of suitable forage for reindeer, and the success of the Alaska experiment is too great to fail to impress the pioneer people of the lower Mackenzie.

The Forest Regions of Central British Columbia. Central British Columbia—that part of the province lying roughly between the 51st and 57th parallels—is a region of great though still undeveloped timber resources (The Forests of Central British Columbia, by H. R. Christie, *Forestry Quart.*, Vol. 13, 1915, No. 4). Nearly 80 per cent, or 80,000,000 acres, is forested, and of this the major portion, about 70,000,000 acres, represents ultimate forest land or land that in addition to its forest products can be utilized only for summer grazing. Exploitation is comparatively small as yet. It gives occupation to a majority of the wage earners, but the population is only one to every ten square miles. It is estimated that complete use of the present timber would bring the province $2,000,000 per annum in royalties alone, while under proper management the yield could be doubled.

Of the six main types of forest the most valuable are those lying to the east and north of the Interior Plateau. The ''interior wet belt'' of the Gold, Cariboo, Selkirk, and Rocky Mountains, with warm summers and a yearly precipitation of 30 to 40 inches, has a rich and varied forest distinguished by rapid growth and large yield. Cedar, hemlock, Engelmann spruce, Douglas fir, lodgepole pine, Alpine fir, and white pine are the chief species. About 75 per cent of the area has been burned over in the last half century, but the second growth is of good quality. Northward, the Upper Fraser basin constitutes another region of great possibilities. In temperature and precipitation and arboreal type it is an intermediate between the ''interior wet belt'' and the ''northern forest.'' It comprises under a fifth of the forested area, somewhat less than the northern forest. The latter occupies the upper basins and headwaters of the Skeena and Peace Rivers. Precipitation, chiefly in the form of snow, amounts to about 20 inches; summer frosts are common, and the forest approaches the sub-alpine type; it is dense and slow-growing. Engelmann spruce and Alpine fir are the dominant species. The forest will be a producer of spruce lumber and pulp. The Interior Plateau, with a part of the western slope of the Rockies south of Yellowhead Pass, accounts for a quarter of the forested area. The small rainfall—10 to 20 inches—is not favorable to good forest growth. Trees are small, and, beyond local use, pulp will be the only considerable product. Unfortunately much of the Douglas fir has been lost by fire and replaced by the less valuable lodgepole pine, the principal species, and poplar. In the deep valleys of the plateau, with hot summers and limited rainfall, grass competes successfully with trees. The parklike forests of the Fraser and North Thompson Rivers are characterized by yellow pine, useful for local needs only. The remaining quarter of the area, the islands and the western slopes of the Coast Range, is covered by the ''north coast forest.'' Abundant precipitation and equable climate are offset by steep slopes and lack of mineral soil. Tree growth is small, and good stands of saw timber of rather local occurrence. This feature, in combination with the wonderful water-power resources, should encourage a development of the pulp industry. Western hemlock, with red cedar and some yellow cedar, and Sitka spruce, are the distinguishing species.

Canadian Trade in 1915. Very significant is Canada's changed standing in foreign trade; thanks largely to the war she has now become a creditor nation. Whereas 1914 showed an adverse balance of $50,000,000 in the import and export of merchandise, 1915 showed a favorable balance of over $240,000,000, gained chiefly by an export increase of nearly 50 per cent (Canada, *Suppl. to Commerce Repts.*, Ann. Series, No. 23a, Washington, 1916). The most distinctive feature of Canadian prosperity in 1915 was the bumper wheat crop of the Northwest Provinces, which is estimated at about 343,000,000 bushels as compared with a little short of 141,000,000 bushels in 1914. Oats and barley show like increases (Canada: Prairie Provinces, *Suppl. to Commerce Repts.*, Ann. Series, No. 23c, Washington, 1916).

Geographic Controls in the Development of Minnesota. In the February number of the *Journal of Geography* is a group of striking essays on the geographic development of Minnesota. One of these, by C. J. Posey, deals with the "Geographic Influences in the Exploration and Early Development of Minnesota." The white man's entry into the state was controlled by the hydrography. The country is a glaciated plain at the head of three drainage systems, the Mississippi, the St. Lawrence, and the Red River, which afford easy access to it. Thus, in spite of its interior position, the territory was entered at an early date. The first authenticated entrance was that of Sieur Duluth in 1679, though it is not improbable that Radisson and Groscilliers were within the boundaries of the present state twenty-four years earlier. The French voyageurs came for furs, the article that formed Minnesota's principal production until 1850. The fur industry, leading to the establishment of trading posts on the main routes, attained its zenith in 1843, when the Hudson Bay Company installed the line of Red River carts connecting St. Paul with Winnipeg. Even today St. Paul remains the primary fur market of the United States, though the Government market for Alaskan furs has recently been instituted in St. Louis.

Unfortunately the water highways are closed to commerce for five months of the year; hence, until the coming of the railroad and the telegraph, Minnesota suffered much from winter isolation. Old newspaper records recounting the way in which the mail was carried by dog train over the ice are reminiscent of present-day methods in Alaska. The first permanent settlements were commonly located about the falls on the rivers where a break in transportation was necessary and where sources of power later led to the creation of urban centers. The establishments below the falls of St. Croix and St. Anthony are early and well-known examples.

The forests constitute the next control of importance. They were, it is true, an impediment to travel—many of the roads made long detours to keep to the prairie—but the disadvantage was far outweighed by the value of the forestal resources. As the output of eastern woods began to diminish the woodsmen turned westward. The pioneers of lumbering in Minnesota came from Maine. By 1850 the lumbering had surpassed the fur industry.

The succeeding decade was remarkable for the development of agriculture. Of the three assignable causes, two—the introduction of labor-saving machinery and railroad building—were common to other sections of the country. The third, the discovery of a new milling process, was peculiar to the spring-wheat area of the Northwest. Its improvement of the grade of flour obtainable from this variety of wheat immediately put a new value on the Minnesota grain and laid the foundation of the state's prosperity (The Wealth of Minnesota, by E. V. Robinson, *Journ. of Geogr., ibid.*). During this decade of agricultural expansion the population increased by 2,730 per cent, a phenomenal figure unrivaled by any other state.

Mineral wealth was the last great resource to be developed. Exploitation of the vast iron ore deposits of the Ranges did not commence until 1884, but, once started, the mushroom towns of the Ranges sprang up quickly enough (Minnesota Cities: Duluth and the Range Towns, by Eugene Van Cleef, *Journ. of Geogr., ibid.*). Hibbing (Mesabi), founded in 1892, now has a population of 12,000. Duluth, the greatest product of the mining industry, with 5,000 people in 1880, is today accredited with 85,000. (Cf. also "Population Controls in Montana" in the March *Review*, p. 217.)

Seismic Activity in California During 1915. To the student of earthquakes California is by far the most interesting state in the Union. Records for last year collected from 179 stations show a total of 83 shocks, a number exceeding that for the remainder of the states combined (California Earthquakes During 1915, by Andrew H. Palmer, *Bull. Seismolog. Soc. of America.*, Vol. 6, 1916, No. 1). The earthquakes appear to have been purely tectonic in character. Analysis of the major shocks shows deep-seated foci, with comparatively long duration of time between preliminary and maximum vibrations and widespread occurrence. Not a single earthquake occurred contemporaneously with an eruption of Mount Lassen. The year afforded a good test of relations between volcanic action and earthquakes, for the volcano maintained a state of unusual activity. Shocks were more severe and numerous in the south of the state, the worst recorded, that of June 22, involving destruction of life and property. With the exception of the Imperial Valley more shocks were registered on the coast than in the interior, a phenomenon probably explainable as a resultant of recent and progressive uplift along the eastern scarp of the southern Sierra Nevada. San Francisco, in a zone of heavy faulting and apparently at the crossing point of opposed stress planes, is associated with high seismicity. Lone Pine, Owens Valley, formerly a notorious seismic center, only experienced a single shock during the year. The increased seismicity in the Imperial Valley, and in Pleasant Valley, Nevada, suggests that migration has taken place along a fault line.

The Carnegie Institution's Investigations in the Salton and Mohave Desert Regions. Brief accounts of the research work carried on in these desert regions under the auspices of the Carnegie Institution of Washington are contained in its *Year Book for 1915* (p. 90-97). Weekly gage-readings of the level of water in the Salton Sea gave a total recession of about 50 inches for the year ending July 1, 1915. Data on the composition and rate of concentration of the chemical constituents were obtained. Material was also gathered on the history of Blake Sea, the ancient precursor of Salton Sea, which promises to be of importance in determining the climatic cycles and the geological succession of plants in the Mohave Desert region. A general reconnaissance of the vegetistic features of this area was made in the autumn of 1914 and the spring of 1915 by Forrest Shreve. This investigation confirmed former results on the slight amount of habital differentiation exhibited by the native plants.

Ellsworth Huntington's studies of climatic changes were continued in the principal basins of the Mohave Desert. Possible evidences of climatic changes found in the terraces and alluvial deposits of the *bajada,* or débris-apron, type by this investigator and E. E. Free afford a new aid in the correct interpretation of these physiographic elements. In the course of these studies Huntington also considered the relation of playas to climatic changes. The stages of their development contribute valuable clues. Death Valley and the area draining into it is an inviting field for these climatic researches. The final correlation undertaken of the diverse types of evidence, botanical, chemical, and physiographic, reveals a close degree of correspondence. A comparison, for example, of the curve of the growth of the sequoia tree and the old strands in Owens Lake shows that periods of high water in the lake corresponded with periods of rapid growth in the trees.

Migrations of Animal Life Over the Isthmus of Panama. Intermigration of animals between the northern and southern continents of America was the subject of a lecture delivered in August, 1915, by Professor W. B. Scott at the San Francisco meeting of the American Association for the Advancement of Science. The lecture is published in *Science* for January 28, 1916 (pp. 113-124).

The zoölogical relations between North and South America were dominated principally by the geography, past or present, of the Isthmus of Panama. Differences in the faunas of the two regions point to extensive geological changes. Periods of land connection and of absolute separation succeeded each other. In the former case likeness of species would be established. In the latter a complete dissimilarity of animals would result. Climate also played its part, as the migrations took place only under favorable climatic conditions. They reached their culmination in the Pleistocene, when mammals common to the two continents appear in greater variety than at any other period. The number of South American types found in North America is small. The list practically does not comprise more than opossums, a few rodents, ground-sloths, and glyptodonts. In contrast to this the range of northern forms present in South America is extensive. These include—to mention only a few—bears, cats, otters, rabbits, mice, horses, llamas, and deer.

Professor Scott attributes this predominance of northern animals over southern to the higher stage of intelligence and of structural development attained by them. He refrains, however, from pointing to the heliotropic instinct present in many forms of life and which compels a search for warmer climates because of the greater ease with which sustenance is derived in lands of sunshine. The southern forms had no equivalent inducement to press northward.

In the Oligocene epoch a broad sea intervened between North and South America. The date of the reappearance of land cannot yet be determined with precision; it probably took place at the close of the Oligocene. The ground-sloth in the middle Miocene beds of Oregon proves that connection had been re-established in the early Miocene. The isthmian region appears to have been broader in the Pliocene, although the isthmus was depressed once more beyond its present limits at some time during the Pleistocene.

The separation of South American mammals into two radically different groups is an evidence of migration. One of the assemblages is autochthonous, the other immigrant. Highly characteristic edentates and a large number of peculiar rodents take rank in the first group. The foreign arrivals consist of beasts of prey and hoofed animals. On the northern continent the southern forms represent remnants of early immigration which could not take deep root on account of climatic obstacles. Central America and the West Indies belong zoölogically to South America. Professor Scott's lecture throws into relief the significant part played by the geographical history of the Isthmus of Panama.

EUROPE

Strategic Features of the Baltic Basin. From the strategic point of view the topography and hydrography of the Baltic Basin present several features of interest (Charles Rabot: La Baltique, *La Nature,* Jan. 1, 1916; Les détroits Danois, *ibid.,* Feb. 26, 1916). The slight salinity of the Baltic waters in contrast with those of the open ocean involves flotation problems both for surface and submarine craft. At the entrance to the sea vessels from the ocean must for each thousand tons' displacement lighten by thirty tons to maintain the normal water line. This circumstance, combined with the frequency of shallows, renders navigation a delicate matter for the smaller submarine with a limited degree of floatability. Some compensation, however, arises from the opacity of the waters, fed to so great a degree from the land. Recent physiographic development creating a fiord type of coast along the north and west has produced features favoring defense and navigation. Behind the outer island wall lies an interior line of communications. Vessels of considerable draft can go from Åland to Kronstadt without passing into the open sea. The similar Swedish line from the extremity of the Gulf of Bothnia to the southern end of the Strait of Kalmar has proved of great service to the German ships carrying ore from northern Sweden to Stettin and Lübeck. Its importance may be gaged by the magnitude attained by the trade—during the first nine months of 1915 no less than 2,000,000 tons of ore were shipped to Germany—and the growth of the port of shipment, Luleå.

The strategic interest of the Baltic concentrates in the ''defile'' of its entrance. The salient features of the Baltic straits are their narrowness and shallowness. They also offer impediments to navigation in their complex and variable currents. The surficial outward-moving current of fresh water, often of slight depth, is susceptible to rapid change in direction with changing winds. Where the water is shallow local eddies are not infrequently caused. Shallowness is the greatest impediment in the Sound. The decline of this most direct route is due in part to the growth of modern vessels as well as to the construction of the Kiel Canal. The Little Belt is deeper but the route longer and its southwestern shore is German territory. The Great Belt, still deeper and more commodious, has been carefully mined. Since the development of the railroad ferry service, the straits may be considered as a land no less than a water defile. By the four lines operating in the straits and the fifth connecting southern Sweden with the German mainland via Rügen transportation proceeds from Scandinavia to Germany without a break. From the beginning of the war, with a slight interruption during the winter of 1914-15, activity along these routes has been unparalleled, for the defile not only concentrates lines of traffic and serves as a depot of supplies but itself lies in a zone of great industrial activity.

Geographical Conditions in the French Alps in 1700. The geographical value of archival documents is specifically illustrated in the paper ''Le Haut Dauphiné à la fin du xvii^{e} siècle'' by Professor Raoul Blanchard (*Recueil des Trav. de l'Inst. de Géogr. Alpine,* Vol. 3, 1915, No. 4, Grenoble). The documents in question pertain to the last of a long series of processes of reassessment for taxation (*procès-verbaux de la révision des feux de 1700*). They comprehend three classes of material of unequal value for geographic interpretation—the remonstrances of the assessed communities, their responses to the formal questions of the assessment, and the reports of the assessment commissions. The communities naturally exaggerated the adverse circumstances of their situation. The importance of climate they fully recognized. To its wretched character they attributed a major portion of their woe. But the statements of neighboring communes are inconsistent, and all are at variance with the nature of the agricultural life revealed in the responses and reports. These demand a climate not very different from that of today. The distribution of such critical plants as the olive, almond, and walnut is identical with that of the present. The vine and the principal cereals were indeed more widely cultivated, for in those days of limited transportation specialization was little known, communities were largely self-supporting. Pastoral industry, too, was entirely subordinate.

Meteorological data, of course, are lacking but, assuming the small cyclic variations that appear in the observations continued over a 125-year period in neighboring Savoy (Annecy), the end of the seventeenth century should have been under favorable temperature conditions. This is confirmed by the contemporaneous state of the glaciers of Savoy. The facts of emigration were likewise adduced by the inhabitants as a proof of general distress. Yet the phenomenon of emigration was then as now an apparently normal response to the mountain environment. Chiefly temporary and seasonal in character, it only attained considerable dimensions at the higher elevations. Altitude and emigration were in close agreement. The movement, for instance, was unknown in the pleasant valley of Grésivaudan. In the mountains, where the chief cereals were only harvested once in two years—the grain takes thirteen months to mature—and where winter industries did not obtain, the peasant solved the question of subsistence by migration for five, six, or seven months of the year. The emigration had no specific objective. It penetrated all France and led the mountaineer into a variety of work, chiefly of laborious and inferior nature. The men who were absent for the longest period of time devoted themselves most largely to petty commerce—peddling. Apart from religious and other exceptional causes the attraction of this lucrative business was perhaps mainly responsible for a certain percentage of population being drawn permanently away from the mountains.

The assessment figures unfortunately do not permit of an entirely satisfactory estimate of the population of the time. They give the number of "hearths" but no clue to a transforming factor. For a study of comparative distribution the empirical figure 4.5 may be taken as the factor for transforming the family unit into individuals. The results so obtained are what might be anticipated. The towns and valleys have gained in population since 1700, the high mountains have lost.

Improvements in Internal Communication to the Port of Marseilles. The opening, on May 7, of the Marseilles-Rhône canal will make possible direct communication between Lyons and Marseilles for the considerable barge traffic plying on the Rhône between these two centers. A unique feature is a tunnel carrying the canal through a ridge which cuts off Marseilles from the interior (Percement du Tunnel de Rove, *La Nature,* March 4, 1916). The tunnel is remarkable for its size and length. It is 72 feet wide and 10 feet deep and is cut through the Chaine de la Nerthe a distance of four and a half miles. Land communication has also been improved by the construction of a new railroad line paralleling the coast westward from Marseilles to the north shore of the outlet of the Berre lagoon and thus connecting with the line to Arles (La nouvelle ligne ferrée de l'Estaque à Miramas (Marseille-Arles), *La Nature,* Feb. 12, 1916). The new line, besides facilitating the transport of troops and merchandise, will assure continuance of communication in the event of a block on the main line to Paris. Although such an accident does not appear probable, it must be borne in mind that the Paris-Mediterranean line pierces the Chaine de la Nerthe by a tunnel nearly three miles long and that the former sole alternative road, the line through Aix, suffers from the disadvantages of single track and steep gradients.

A Geographical Commission for Russian Poland. The German government has organized a "landeskundliche Kommission" for the study of the geography of Poland (*Geogr. Zeitschr.,* Feb., 1916). The area of investigation is practically that of the Kingdom of Poland as defined by the Congress of Vienna in 1815, or the Vistula provinces of Russian designation. The commission intends to publish a geographical handbook of Poland, based on the available literature and on the field investigations of its members. A series of detailed regional studies will also be published. The subjects represented by the members of the scientific staff, of which Dr. Max Friederichsen, professor of geography at the University of Greifswald, is director, are: structural and historical geology, glacial geology, geophysics, meteorology, and ethnology. In addition, several members of the civil administration will study the economic and commercial geography of the region, and the staff of the military meteorological service of the eastern front will contribute an account of the climatology.

Bulgarian and Turkish Mineral Resources. The participation of Bulgaria and Turkey in the war on the side of the Central Powers was welcomed in Germany on the ground of substantial economic advantages. The mineral resources of the two countries (Turkey is here practically synonymous with Asia Minor) are discussed in an article by Dr. Paul Krusch, of the Prussian Geological Survey, in the *Berliner Tageblatt's* weekly edition of December 29, 1915. According to this authority coal of all grades occurs both in Bulgaria and Turkey. In Bulgaria anthracite is found in the Balkan Range near Shipka Pass along the contact between the old eruptives and the limestones.

This form of coal is rare in Turkey. Both countries teem, however, with lignite beds. In Bulgaria they occur in the Cretaceous foreland between the Balkan Range and the Danube, in the central part of the Balkan Range itself, and in the Tertiary lacustrine deposits of intermont basins west of Sofia. In Turkey they are of widespread occurrence.

Iron, although known both in Bulgaria and Turkey, has not been worked extensively in either country. Explorations conducted on the site of reported discoveries appear to have yielded no startling results. Turkey is perhaps better favored as regards quantity, although its transportation facilities are totally inadequate for the handling of large tonnages. The importance of the countries as copper producers is greater, especially in the case of Turkey. Bulgaria's yield amounted to 1,650 tons of copper in 1911. Turkey's annual production of this metal attains approximately the same figure. The existence of a rich copper belt along the eastern shore of the Black Sea as well as in the basin of the upper Tigris is suspected. Both of these regions are thickly studded with ancient workings. The deposits of the Tigris region have been worked in a desultory fashion since the eleventh century.

Lead and zinc are not abundant in Bulgaria, but occur in Asia Minor in large deposits along the contact between the Tertiary eruptives and Carboniferous limestones. In general it may be said that of the two countries Turkey is by far the richer in mineral wealth. It is extremely doubtful, however, whether the Teutonic powers will be able to derive any advantage from this fact in the present war. Most of the Bulgarian and Turkish deposits require at least two years' development and the expenditure of adequate capital before being made to yield their treasures. Appreciable quantities cannot therefore be mined before the end of 1917, provided the work was started last fall. The gradual passing of Turkish territory into Russian hands will likewise prevent shipments of Turkish ore from reaching German or Austrian localities of consumption.

ASIA

The Turks in Asia. An echo of Constantinople ''Panturkists'' is found in an article by Professor Eugen Oberhummer of the University of Vienna in the *Geographische Zeitschrift* for February (Die Türken und das osmanische Reich, Vol. 22, 1916, pp. 52-87). According to this authority the number of Turks scattered over the vast Asiatic steppeland amounts to about 28,000,000. From the peninsula of Anatolia to western China a traveler speaking Turkish and proceeding north of the central mountain belt of Asia can generally make himself intelligible to the Tatar nomads on his path. Approximately 8,000,000 of these Turks dwell within Turkish official limits. The largest body—some 15,000,000—is found on Russian territory. Persia harbors 2,000,000. Approximately the same number reside in Khiva and Bokhara, while fully 1,000,000 live in China. All these Turks or Tatars speak the same form of Uralo-Altaic language. In Persia and Turkey the admixture of Arabian and Persian words in their language is large. North and east of Persia, however, the language flourishes in its primitive simplicity, free from foreign intrusions. It is interesting to note that in Turkey, where Turks are endeavoring to create feeling in favor of the union of Turkish-speaking peoples, the total number of Turks is placed at between 60,000,000 and 70,000,000. These excessive figures are obtained by including every tribe of Uralo-Altaic speech, practically all the Siberians, and the Mongols or kindred groups.

Racially the Turks belong to the broadheaded type of Central-Asian mobile peoples and are believed to be descended from the Mongols. The original type has disappeared in the course of their westerly expansion, owing to excessive intermixing with alien peoples. This can be seen today in Turkey, where the so-called Turk presents no physical difference from the conquered Christian populations. Indeed it is a characteristic of the Turk to resemble in appearance the peoples among whom he has settled. Thus the Turks of Armenia resemble Armenians, while on the Ionian coast they differ but slightly from the Greeks. But between the true Turk who has managed to preserve his Central-Asian individuality and the Tatar no difference can be found in language or race. The Turk of western Asia is the Tatar of central Asia or the Mongol of eastern Asia, to whom he is known as Ta-ta. The transition from the oblique to the normal eye as one proceeds westward from the Mongol's territory to the Anatolian tableland of the Turk is observable among the Tatars. As in eastern Europe the Turk is an intruder in western Asia.

Irrigation in the Punjab. The opening last December of the Upper Jhelum Canal completes the Punjab Triple Canal Project within the short time of ten years. It is estimated that the scheme will add not far short of two million acres of productive land to this already vastly important granary of the British Empire. According to the latest official returns (Agricultural Statistics of India, 1912-1913, Vol. I, Calcutta, 1915) about 11,500,000 acres—half the total cultivated area—are dependent on irrigation, one-third from wells, two-thirds from the Government canals. Of this area 4,500,000 acres are under wheat. Irrigation thus accounts for rather more than half the total wheat acreage of the entire province, but the production from the irrigated lands is greatly superior; the ratio of yield for irrigated and non-irrigated being about 9:5.5. Specific references to the areas irrigated by the canals may be found in *Nature* (No. 2415, Vol. 96, 1916) and *United Empire* (N. S., Vol. 7, 1916, No. 2).

Operations of the Survey of India. The last report issued by the Survey of India covers operations undertaken from October 1, 1913, to September 30, 1914. Among the notable events of the period mention is made of the return of Captains Bailey and Morshead from six months' exploration in the eastern Himalayas. The work of both officers added greatly to our geographical knowledge of this region, besides clearing up all doubts as to the course of the Tsan-po, or Brahmaputra River (see "The Identity of the Sanpo and Dihang Rivers," *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 259-264.) The success of experiments to determine accurate differential longitudes by wireless telegraphy across the highest mountain ranges is also reported. These tests were conducted in the course of De Filippi's expedition to the Karakoram and in co-operation with the Survey's observatory at Dehra Dun. Differential longitudes between this station and points on the upper reaches of the Indus as far as Leh, on both sides of the Karakoram Pass, and in Chinese Turkestan were determined by the simultaneous recording of wireless telegraphic signals sent out by the Lahore radio office combined with astronomical observations. Additional exploration was carried on the North-East Frontier by Lieutenant Huddlestone. This officer accompanied a mission into the Aka country lying west of the country of the Abors and succeeded in making a reconnaissance survey of an area about 4,000 square miles in extent. This brings the total area surveyed since 1911 in the North-East Frontier Territory to about 49,000 square miles.

Siberian Traffic Problems. Although the traffic congestion at the port of Vladivostok is reported to be considerably relieved, private merchandise is still apt to suffer delay in transit, for 75 per cent of the available railroad freight space is reserved for Government use (*Commerce Repts.*, No. 67, Washington, 1916). A certain measure of relief is anticipated with the opening up of the navigation season on the Amur River, an event timed for the middle of June. The route thus available extends up the river for some 2,000 miles from Nikolayevsk at its mouth to Sryetensk on its left headwater branch, the Shilka, at the head of navigation for larger craft. Sryetensk is connected by a branch line with the main Trans-Siberian Railway and also with the Amur Railway. The latter, which is to provide an all-Russian rail route to the Pacific (the eastern end of the Trans-Siberian crosses Chinese territory), parallels the Amur on the north at some distance from the river as far as Khabarovsk, where rail connection with Vladivostok exists. Construction on the Amur Railway was begun in 1908 and has to date progressed as far as Blagovyeshchensk, a distance amounting to about 60 per cent of the total line to be built (Baedeker's Russia, 1914 edit., p. 539 and map facing p. 497). The traffic problems of the Siberian ports are closely related to those of our own Pacific ports. In this connection it is interesting to note that a new shipping agency has been established in Seattle operating a fleet of eight vessels chartered to sail between Puget Sound and Vladivostok (*Commerce Repts.*, No. 32, Washington, 1916).

WORLD AS A WHOLE AND LARGER PARTS

Early Hispano-Japanese Relations. A valuable bibliography of early Portuguese and Spanish contact with Japan by James A. Robertson is contained in the February, 1915, issue of the *Transactions of the Asiatic Society of Japan.* This intercourse centers chiefly around the great missionary movements which originated in the Iberian peninsula after the discovery of America. At the same time, the main purpose of Portuguese as of Spanish oversea activity was commercial.

In the middle of the sixteenth century, shortly after the accidental discovery of Japan by the Portuguese, there appeared to be reason to believe that Christianity was destined to spread rapidly in the islands. The Japanese *daimios* manifested eagerness to establish close trade relations with the west and made great show of friendliness towards Portuguese Jesuits and Spanish friars. The revulsion in feeling which took place at the end of the same century was due to the intolerance of the Christian missionaries no less than to a dawning conviction among the Japanese that the missionaries were merely disguised agents engaged in paving the way for the ultimate conquest of the land by western sovereigns. The friendly relations which had marked the beginning of Hispano-Japanese intercourse gave place to ruthless persecution of Christian communities of converts by the islanders.

Considerable commercial rivalry also appears to have existed between the Japanese and the Spaniards with regard to the Philippine trade. Japanese junks found their way to the islands and carried traders who settled in Manila and other points to carry on their business. This apparently did not suit the Spaniards, and there was little mutual understanding between them and their eastern competitors.

HUMAN GEOGRAPHY

Man's Influence Upon the Earth. In the study of the reciprocal relations of man and earth the emphasis is placed rightly on the physical environment as affecting the activities of man. The effects of man on the earth, although universally recognized, have received but occasional systematic attention. The geologic texts of Lyell, Dana, and Chamberlin and Salisbury make brief mention of man as a physiographic and geologic agent. Recent suggestive articles on this topic have been written by A. Woeikof (De l'influence de l'homme sur la terre, *Ann. de Géogr.*, Vol. 10, 1901, pp. 97-114 and 193-215); C. P. Lucas (Man as a Geographical Agency, *Geogr. Journ.*, Vol. 44, 1914, pp. 479-492); and, most recently and most exhaustively, by Ernst Fischer (Der Mensch als geologischer Faktor, *Zeitschr. der Deutschen Geol. Gesell.: A. Abhandl.*, Vol. 67, 1915, pp. 106-148, listed in the Feb. *Review*, p. 168).

Fischer points out the fact that man is at present one of the leading agents in the direct modification of the earth's surface. He estimates the mass of material moved annually in the production of ores, mineral fuels, and salt at one cubic kilometer and would possibly double this figure for all mineral industry. To this amount are to be added the vast quantities of earth and rock moved in building and agricultural operations. Even more important is man's release or stimulation of physiographic forces, there being in general a great disproportion between the forces released and the energy expended by man in disturbing their equilibrium. The control of streams, the reduction of lake and swamp areas, the increased run-off, the decreased cover of vegetation, and, more especially, the rapid exploitation of the great ground-water reservoir represent, in the opinion of the author, the most extensive interference by man with the physiographic processes. The influence of man, as that of the other surficial agencies, is dominantly degradational, with occasional and minor aggradional activities.

Man is an important ecological factor, in other words, is modifying profoundly the paleontological record of the future. The adjustment of plant associations is being disturbed by the introduction of new species, by the clearing and cultivation of land, by fire, and other means resulting from the voluntary or involuntary meddling of man. Similar revolutionary changes are wrought in the animal world, especially among the larger animals and among numerous parasitic forms.

By his distribution through all climatic regions and his power to employ great physical forces man has become the guide fossil of the present geologic period. A consciousness of this geologic role of man is necessary for the continued well-being of future generations. Conservation therefore becomes a problem of geology, as well as geography.

Carl O. Sauer.

Blackwater Fever and a Specific for It. Wide publicity should be given the offer of Carlotta J. Maury (*Science*, March 10, 1916, p. 349) to submit for expert study a specimen of a plant from the interior of Venezuela which is used by the natives as a specific for the dreaded blackwater fever. Tropical lands not only present great climatic difficulties to the colonizer but also a number of unconquered diseases. Moreover the tropical lands of the western hemisphere are but thinly peopled in spite of great natural wealth. The lack of an adequate labor supply is the chief drawback to the exploitation of both soils and forests. When endemic diseases are conquered or measurably suppressed the present populations will be conserved and new or colonizing populations attracted. Every fact even suggesting a discovery in the field of tropical medicine should be thoroughly investigated. As soon as three or four unfilled temperate regions of the world are occupied the comparatively empty tropical lands of America will have a high potential value to the white race.

GEOGRAPHICAL NEWS

An American Historical Atlas. Satisfactory progress is reported on the proposed Atlas of the Historical Geography of the United States undertaken by the Department of Historical Research of the Carnegie Institution of Washington (*Year Book for 1915,* pp. 177-178). The letterpress by Dr. Charles O. Paullin is in a fair way of completion, and maps in suitable form for execution by photolithography have been prepared from his sketches. The history of presidential elections will thus be cartographically illustrated.

Other sections of the work are also nearing achievement. A general physical map has been prepared by Professor R. H. Whitbeck of the University of Wisconsin, which is to be used as a base in the representation of economic features during various periods of American history. A chart showing oceanographic data related to American history has likewise been prepared by G. W. Littlehales of the Hydrographic Office.

Retirement of Professor Richard Elwood Dodge. Professor Richard Elwood Dodge, after twenty years' service as teacher of geography in Teachers College, Columbia University, has resigned his professorship, to devote himself uninterruptedly to those aspects of geography that interest him most, applied geography in the field of rural and especially agricultural education. Professor Dodge has gained a high place in educational geography. As the author of the ''Dodge Geographies'' and allied series, he has probably done more than any other man in the country in improving geographic education in elementary and particularly rural schools. We are too slow in this country in recognizing the value of this type of work as distinguished from ''research.'' We must have research, but the fruits of research are withheld from the public unless the great memoirs are translated into common language. The geography of the average citizen is obtained from his grammar school text, not from memoirs which he almost never sees, much less reads.

It is a pleasure to announce at this time that Professor Dodge has been again appointed Editor of the Annals of the Association of American Geographers, a position which he held from 1911 to 1915. To this work he brings unusual experience. In 1897 he founded and edited the *Journal of School Geography*, which later became the *Journal of Geography*. In a list of the contributors to that journal would be found the names of most of the American geographers of the time; and the volumes contain a large body of geographic material that has permanent value.

PERSONAL

MRS. HARRIET CHALMERS ADAMS gave an illustrated lecture on Spain before the Geographical Society of Philadelphia on May 3.

PROF. CHARLES P. BERKEY, of the department of geology of Columbia University, outlined the plans of the New York Academy of Sciences for field work in Porto Rico during 1916 before the Academy on May 15.

PROF. ELIOT BLACKWELDER, of the department of geology of the University of Wisconsin, has been appointed professor of geology and head of the department at the University of Illinois. The appointment will take effect on September 1.

MR. C. E. P. BROOKS read a paper on February 16 before the Royal Meteorological Society of London on ''The Rainfall of Nigeria and the Gold Coast.'' The paper dealt with the rainfall on the Guinea Coast and its hinterland for the ten years 1904-13.

PRESIDENT NICHOLAS MURRAY BUTLER of Columbia University, in his address on national unity before the Associated Press on April 25, touched upon geographic influences as illustrated by the tendency of a people to make its national domain coextensive with a well-defined natural unit. He is quoted as saying:

''A nation is scientifically defined as a population of an ethnic unity inhabiting a geographic unity under a common form of government. The exceptions are quite numerous enough to prove this rule. As the centuries have followed one another it is not difficult to see how the several nations have endeavored to possess themselves of territory that is a geographic unit. They have sought natural boundaries, whether of high mountains, or of broad rivers, or of the sea itself. One war after another is to be explained in terms of a nation's definite purpose to possess itself of a geographic unity as its home. There has been by no means equal care taken by the nations to establish and to protect an ethnic unity.''

PROF. HENRY E. CRAMPTON, of Barnard College and the American Museum of Natural History, gave an illustrated lecture on ''Kaieteur and Roraima: The Great Falls and the Great Mountain of Guiana'' before the Appalachian Mountain Club of Boston on February 4.

MR. W. C. CRANDALL, master of the *Alexander Agassiz*, the sea-going scientific collecting vessel of the Scripps Institution for Biological Research at La Jolla, near San Diego, Cal., will give a course on ''Local Coastal Physical Geography'' at the ''summer assembly in science'' of the institution, which will be held from June 25 to August 15.

DR. CLIFFORD H. FARR spoke on ''Jamaica and Its Plants'' before the Torrey Botanical Club on May 9.

DR. CRISTOBAL HICKEN read a paper on January 22 at the annual meeting of the Society of American Foresters in Washington, D. C., on ''Vegetation Zones of Argentina and Adjoining Regions.''

MR. E. T. HODGE spoke on May 15 before the New York Academy of Sciences on the ''Geology of the Coamo-Guayama Region, Porto Rico.''

MR. J. W. JACKSON spoke on February 8 before the Literary and Philosophical Society of Manchester, England, on ''The Geographical Distribution of the Shell-Purple Industry.'' The paper dealt with the production of purple dye by the Phoenicians and its spread to eastern Asia and Central America.

PROF. DOUGLAS W. JOHNSON of Columbia University addressed the members of the Geographical Society of Philadelphia on ''Geographical Features of the Russian Retreat'' at their annual luncheon on April 29. At the request of Major-General Leonard Wood, Professor Johnson will discuss the influence of topography on the European war at the military camps at Plattsburg during the coming summer.

SIR DOUGLAS MAWSON sailed on May 2 from New York for England on the *S.S. Orduna.* He had arrived from Australia the day before and was on his way to London to take up duties assigned to him in the War Office.

DR. GEORGE E. NICHOLS, assistant professor of botany in Yale University, gave an illustrated lecture on April 15 before the Biological Club of Mount Holyoke College on the ''Plant Societies of Connecticut.''

DR. ERLAND NORDENSKIÖLD'S collection of ethnographical specimens, made on his recent expedition in the boundary districts of Bolivia and Brazil, referred to in the April *Review* (p. 308), have safely reached the museum in Göteborg. For a time fears were entertained as to their safety, as it was thought they might have been lost when the German cruiser *Karlsruhe* sank (*Zeitschr. fur Ethnologie,* 1915, No. 4-5, pp. 322-323).

MR. W. J. PERRY spoke on February 8 before the Literary and Philosophical Society of Manchester, England, on ''The Geographical Distribution of Terraced Cultivation and Irrigation.''

MR. D. R. SEMMES spoke on May 15 before the New York Academy of Sciences on the ''Geology of the San Juan District, Porto Rico.''

SIR NAPIER SHAW presented a paper before the Royal Meteorological Society of London on March 15 on ''The Meteorology of the Globe in 1911.'' The paper dealt with the material in the first of a series of annual meteorological summaries for the world about to be published by the London Meteorological Office. The volume for 1911 will give, besides other information, particulars of pressure, temperature, and rainfall for available stations in all parts of the globe at the rate of two stations for each ten-degree square.

DR. J. R. SUTTON read a paper on February 16 before the Royal Meteorological Society of London on ''South African Coast Temperatures.'' This paper dealt with the normal monthly mean temperatures at selected stations on the coast of South Africa, a few miles inland, and on the tableland.

DR. ERICH WUNDERLICH, assistant in the department of geography at the University of Berlin and one of the junior members of the Society's Transcontinental Excursion of 1912, has been appointed geographer to the ''Landeskundliche Kommission'' organized by the German government for the study of Russian Poland, to which reference is made on page 459. Doctor Wunderlich will devote himself especially to the glacial geology of the region.

OBITUARY

DR. CHARLES A. DAVIS died on April 9, aged 55. He was widely known as a peat expert. In this capacity he served the U. S. Geological Survey from 1907 to 1910 and the Bureau of Mines from 1910 to 1912, at which date his title was changed to fuel technologist. Davis' two most important contributions to the subject are: ''Peat: Essays on Its Origin, Uses, and Distribution in Michigan'' (*Michigan Geol. Surv. Rept. for 1906*, pp. 93-395) and ''The Uses of Peat for Fuel and Other Purposes'' (214 pp., *U. S. Bureau of Mines Bull. 16*, 1911). He was a member of the Association of American Geographers.

DR. FRITZ REGEL, professor of geography at the University of Würzburg, died at that city on December 2, 1915, aged 62. Prior to his connection with this institution, from 1884 to 1909, he had represented geography at the University of Jena, first as instructor, then as associate professor. To this period belong his publications on Thuringia, his native district: ''Die Entwickelung der Ortschaften im Thüringerwald,'' *Ergänzungsheft zu Petermanns Mitt. No. 76*, 1884; ''Thüringen: Ein geographisches Handbuch,'' 3 vols., Jena, 1892-96; ''Thüringen, ein landeskundlicher Grundriss,'' Jena, 1897. In 1896-97 Regel made a trip to South America to study the Colombian Andes. On his return he published a monograph on the geography of Colombia (in series *Bibliothek der Länderkunde*, Berlin, 1899) and contributed the section on this country to Mill's ''International Geography.'' Another helpful regional geography is his ''Landeskunde der Iberischen Halbinsel'' (*Sammlung Göschen No. 235*, Leipzig, 1905). His later publications deal mainly with commercial geography and countries of economic interest. He wrote a manual entitled ''Handelsgeographie'' (6th edit., Stuttgart, 1912, reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 862) and contributed the section on Latin America to ''Karl Andree's Geographie des Welthandels,'' (Vol. 3, Frankfurt, 1913) and Scobel's ''Geographishes Handbuch'' (Leipzig, 1910), also on western, northern, and eastern Europe in the latter. A publication on the Panama Canal (series *Angewandte Geographie*, 1909, reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1909, p. 187) is of interest because of its geographical treatment of the topic.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the January number, pp. 57-61

NORTH AMERICA

Alaska

Pilder, Hans. **Die Russisch-Amerikanische Handels-Kompanie bis 1825.** 174 pp. (Series: Osteuropäische Forschungen, im Auftrag der Deutschen Gesellschaft zum Studium Russlands herausgegeben von Otto Hoetzsch, Otto Auhagen, Erich Berneker.) G. J. Göschen, Berlin and Leipzig, 1914. M. 4.80. 9½ x 6½.

As most of the publications and practically all the original documents relating to the Russian-American Company are in Russian, they are accessible to relatively few students. Doctor Pilder has, therefore, performed a valuable service by compiling from Russian and other sources a large amount of information about the early history of the great corporation which controlled Alaska for over sixty years.

Yet this work cannot be considered an exhaustive treatise, for the sources of information are largely secondary. The American reader will here find little not already set forth in H. H. Bancroft's "History of Alaska." In fact, the close parallelism between a part of Doctor Pilder's text and that of Bancroft's work, to which he makes no reference, plainly indicates that both treatises are based on the same Russian authorities. In the interest of historical accuracy it would appear that the author has placed altogether too much reliance on Chlebinikof's biography of Baranof.

The geography in this volume leaves much to be desired and indicates that no use of maps was made in its preparation. Among the more glaring errors is the calling of the St. Elias Range the Rocky Mountains. Three Saints Bay at the southern end of Kodiak Island is confused with St. Paul Harbor at the northern end. The Commander Islands are called the Kurile Islands, and Chirikof, instead of Bering, is credited with their discovery. The locality of the landfalls of both Chirikof and Bering on the Alaska coast in 1741 is wrongly given.

As Doctor Pilder uses the old Russian geographic nomenclature, it is difficult to follow the text on modern maps. Few readers will recognize Kenai Sound as Cook Inlet, or, still less, Chugach Sound as Prince William Sound. Even in this he is not entirely consistent, for the old Russian settlement of New Archangel is referred to under its modern name of Sitka. The translation of English names into Russian and thence into German has metamorphosed Shields into "Schilz," Davis into "Dewis," Meek into "Mik," and O'Cain into "Okein."

The appendix contains some valuable translations of Russian documents relating to the history of the colony. Alfred H. Brooks.

Channel Islands to Cordoba, Orca Bay and Inlet, Prince William Sound, Alaska. 1:30,000. Chart No. 8525, U. S. Coast & Geodetic Survey, Washington. Edit. of Jan., 1916. Price, 30 cents.

Kuskokwim Bay, west coast of Alaska. 1:200,000. Chart No. 9103, U. S. Coast & Geodetic Survey, Washington. Edit. of March, 1915. Price, 50 cents.

Eek Island to Bethel, Kuskokwim River, west coast of Alaska. 1:100,000. Chart No. 9104, U. S. Coast & Geodetic Survey, Washington. Edit. of March, 1915. Price, 30 cents.

Cape Resurrection to McArthur Pass, Alaska. 1:80,000. Chart No. 8527, U. S. Coast & Geodetic Survey, Washington. Edit. of July, 1915. Price, 50 cents.

Ulloa Channel of San Christoval Channel, west coast of Prince of Wales Island, southeast Alaska. 1:40,000. Chart No. 8155, U. S. Coast & Geodetic Survey, Washington. Edit. of Dec., 1915. Price, 50 cents.

Canada

General

Abbott, F. H. **The Administration of Indian Affairs in Canada.** Ills., index. 148 pp. Board of Indian Commissioners, Washington, D. C., 1915.

Adams, F. D. **Our Mineral Resources and the Problem of Their Proper**

Conservation. *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 52-69. Bryant Press, Ltd., Toronto, [1915].

—— **Canada as a Resort for the Tourist: The Dominion's Three Transcontinental Railways That Have Opened Vast Regions for the Delight of the Sightseer and the Profit of the Pioneer.** Ills. *Dun's Rev.: Internatl. Edit.,* Vol. 27, 1916-17, No. 2, pp. 45-48. New York.

—— **Canada Year Book, The: 1914. Published by authority of the Minister of Trade and Commerce.** xvi and 698 pp. Maps, ills., index. J. de L. Tache, Ottawa, 1915. 9 x 6. [Official handbook compiled in the Census and Statistics Office. Contains data on physical features, climate, economic conditions, and population of Canada. Special features this year are the articles on geology in relation to agriculture in Canada, by Wyatt Malcolm, and a general survey of the climate of Canada, by R. F. Stupart. A list is given of the principal publications of the Dominion and provincial governments.]

—— **Conservation, Commission of: Report of the Sixth Annual Meeting Held at Ottawa, January 19-20, 1915.** 333 pp. Map, ills., index. Bryant Press, Ltd., Toronto. [Includes reports on the conservation of forest, fur and fish, mineral and water-power resources and the report of the agricultural survey work carried on by the Commission.]

Copping, A. E. **Canada To-Day and To-Morrow.** 275 pp. Maps, ills., index. Cassell & Co., London, 1911. $2.50. 8 x 5½.

Donnell, Allan. **The Canadian Fresh Sea Fish Trade.** Ills. *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 180-184. Bryant Press, Ltd., Toronto, [1915]. [See also note on "Canadian Fisheries, 1914-15" in the February number, p. 141.]

Haanel, Eugene. **The Utilization of Some of Our Non-Metallic Mineral Resources Suggested by Present Conditions.** *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 34-51. Bryant Press, Ltd., Toronto, [1915].

—— **Irrigation, Report on, for 1914.** 222 pp. Maps, ills., index. *Dept. of the Interior Ann. Rept. 1914,* Part 7. Ottawa, 1915.

Klotz, Otto. **Seismology, Terrestrial Magnetism, and Gravity.** Maps, diagrs., ills. *Rept. of the Chief Astronomer 1911,* pp. 5-92. Dept. of the Interior, Ottawa, 1915.

Laureys, Henri. **Les métaux précieux du Canada.** Diagrs., ills. *Bull. de la Société de Géogr. de Québec,* Vol. 9, 1915, No. 6, pp. 323-334.

Stupart, R. F. **Report of the Meteorological Service of Canada for the Year Ended December 31, 1912.** Vol. 1: Introduction and Parts 1-3, xvi and 367 pp. Vol. 2: Parts 4-6, pp. 370-568. Dept. of Marine and Fisheries, Toronto, 1915.

Thornhill, J. B. **Colonization Within the Empire: Canada Generally and the Coastal Belt of British Columbia in Particular.** *United Empire,* Vol. 6, 1915, No. 10, pp. 742-747.

—— **Water Powers of Canada: Notes on the Natural Resources and Some of the Developments.** Ills. *Sci. Amer. Suppl.,* No. 2090, Vol. 81, 1916, Jan. 22, pp. 56-57.

White, A. V. **Water and Water-Power Problems.** Ills. *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 136-151. Bryant Press, Ltd., Toronto, [1915].

UNITED STATES

South Atlantic States

Canby, H. S. **Top O' Smoky.** Ills. *Harper's Mag.,* No. 790, Vol. 132, 1916, March, pp. 573-583. [Valley and cove people of the Southern Appalachians.]

Fassig, O. L. **A Remarkable Fall of Hail in Maryland.** Maps, ills. *Monthly Weather Rev.,* Vol. 43, 1915, No. 9, pp. 446-448. [Abstracted in the May *Review,* p. 372.]

Hennen, R. V., and R. M. Gawthrop. **Wyoming and McDowell Counties.** xxvii and 783 pp. Maps, diagrs., ills., index; also maps in separate case. *West Virginia Geol. Surv. County Repts.* Wheeling, 1915. [Important report on the geology of the two adjoining counties in the southernmost part of the state in which the Pocahontas and New River coal groups attain their maximum development. A chapter each is devoted to the historical and industrial development of the region (18 pp.), to its physiography (14 pp.), and its structure (15 pp.). There are three chapters (513 pp.) on the mineral resources, the longest (475 pp.) being devoted to coal. A topographic map, 1:62,500 (relief in 50-foot contours, based on the U. S. Geological Survey map, with corrections and additions by the author) and an original geologic map on the same scale accompany the report.]

Krebs, C. E., and D. D. Teets, Jr. **Cabell, Wayne, and Lincoln Counties.** xvi and 483 pp. Maps, diagr., ills., index; also maps in separate case. *West Virginia Geol. Surv. County Repts.* Wheeling, 1913. [Important report on the natural resources of these westernmost counties, lying within the angle formed by the junction of the Big Sandy with the Ohio. There are chapters on the historical and industrial development (22 pp.), the physiography (11 pp.), the general geology (47 pp.), petroleum and natural gas (108 pp.), coal (20 pp.), other mineral resources (10 pp.), timber (5 pp.), and soils (134 pp.), and a list of elevations (16 pp.). Of each county there are three maps, 1:62,500, representing (1) topography, (2) general and economic geology, and (3) soils. The first is based on the U. S. Geological Survey, the second is original, and the third is reprinted from a soil survey undertaken in co-operation with the state by the Bureau of Soils of the U. S. Department of Agriculture.]

Reger, D. B. **Lewis and Gilmer Counties.** xx and 660 pp. Map, ills., index; also maps in separate case. *West Virginia Geol. Surv. County Repts.* Wheeling, 1916. [Similar in scope to report by Hennen and Gawthrop, listed above. To these central counties are devoted chapters on historical and industrial development (20 pp), physiography (12 pp.), structure (11 pp.), petroleum and natural gas (326 pp.), coal (98 pp.), and other mineral resources (18 pp.). A topographic map, 1:62,500, based on the U. S. Geological Survey (20-foot and 50-foot contours) and an original formational and economic geologic map, 1:65,000, accompany the report.]

Neuse River and upper part of Bay River, North Carolina. 1:40,000. Chart No. 538, U. S. Coast & Geodetic Survey, Washington. Edit. of Feb., 1915. Price, 50 cents.

Portsmouth Island to Beaufort, including Cape Lookout Shoals, North Carolina. 1:80,000. Chart No. 1233, U. S. Coast & Geodetic Survey, Washington. Edit. of June, 1915. Price, 50 cents.

Tampa Bay to Cape San Blas, Florida. 1:450,000. Chart No. 1114, U. S. Coast & Geodetic Survey, Washington. Edit. of Oct., 1915. Price, 50 cents.

Western States

Lewis, A. D. **Irrigation and Settlement in America.** 258 pp. Maps, diagrs., ills. The Government Printing and Stationery Office, Pretoria, 1915. 11 x 9.

The discovery of America by people from abroad is still going on and with increasing value to the world. Interest is not limited to purely geographical features, but the most important observations are those which pertain to the use being made of the opportunities offered by nature and of the methods employed in overcoming natural difficulties. The more recently settled or newer parts of the country in particular afford useful examples to citizens and officers of other new countries. An increasing number of visitors are coming from Australia, South Africa, and the drier parts of the world to see for themselves how the Americans have handled the problem of irrigation of arid lands.

An example of this semi-scientific or technical exploration is afforded by the present book, whose author is an engineer of the Irrigation Department of the Union of South Africa and was formerly connected with the Public Works Department in the Punjab, India. It is peculiarly interesting to Americans, and to engineers in particular, to see how their achievements are viewed through foreign eyes. In the present instance the description is confined largely to relatively superficial matters and to a compilation of statements and data printed in numerous reports. The chief value of the book to American readers is in bringing together in accessible form the principal facts concerning some of the larger irrigation enterprises in the western part of the United States. In his three months' visit the author obtained only a general view and could not fully appreciate American achievements in surmounting great obstacles interposed not merely by nature but by economic and financial conditions. He has not attempted to go far beyond the description of the things seen at the time he visited the country.

The chief danger of a book of this kind may be a tendency on the part of the people in other countries to copy some of the methods or institutions which have been developed in the West without appreciating that many of these are undesirable and should be considered as warnings rather than as desirable precedents. For instance, in describing state control of irrigation development it is pointed out that there are certain state commissions which under existing laws are supposed to safeguard the interests of all the people, notably of the investors in irrigation works and of the settlers under them. There is not pointed out, however, the even more important fact that the *ex-officio* state boards have been lamentably ineffective because of the fact that the men constituting the boards have been overloaded with official duties, thus preventing them from giving adequate time and thought to a business which in itself is extremely difficult. Moreover these officials are changed before they have time to study the problems and, being selected wholly for political reasons, have usually little or no interest in the complicated matters.

It does not appear also that practically all large private irrigation projects have been financially unsuccessful, and that great hardships and suffering have resulted not only to the settlers under many of these, but also to the small investors who have been induced to buy the stocks and bonds of irrigation companies. It is true that such a conclusion has naturally no very large place in a discussion of topographical and engineering features; but at the same time in a book of this kind a warning note should be sounded.

It is now being appreciated as never before that it is the duty of the engineer not merely to plan and build effectively and economically but, more than this, to see to it that the works which he is planning can be usefully employed after he has finished them. No matter how great wisdom may be shown in overcoming difficulties, the engineer will not receive proper recognition, but rather the reverse, if it happens that the results of his work lead to loss and hardship on the part of large numbers of people.

Taking the description as a whole, it has value as above stated in affording a broad review of some of the larger irrigation works of the country. In particular the pictures are excellent, but the maps and drawings are not up to the standard of the rest of the book, notably in the use of the old-fashioned ''caterpillar'' form of representing mountains. The failure to arrange the maps with the north at the top of the page leads to some difficulty in orientation. The omission of an index in a book of this kind is to be condemned. F. H. NEWELL.

GERRY, C. N. **Gold, Silver, Copper, Lead, and Zinc in Idaho and Washington in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914,* Part I, pp. v and 597-654. U. S. Geol. Surv., Washington, 1915.

GIFFORD, E. W. **Composition of California Shellmounds.** Map. *Univ. of California Publs. in Amer. Archæology and Ethnology,* Vol. 12, 1916, No. 1, pp. 1-29.

GREGORY, H. E. **The Oasis of Tuba, Arizona.** Maps, diagr., ills. *Annals Assoc. Amer. Geogrs.,* Vol. 5, 1915, pp. 107-119. [Abstracted in the May number, pp. 371-372. For the general background of this paper see the same author's ''The Navajo Country,'' *Bull. Amer. Geogr. Soc.,* Vol. 47, 1915, pp. 561-577 and 652-672.]

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Arizona in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914,* Part I, pp. v and 757-797. U. S. Geol. Surv., Washington, 1915.

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Montana in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914,* Part I, pp. v and 757-797. U. S. Geol. Surv., Washington, 1915.

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Nevada in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914,* Part I, pp. v and 655-716. U. S. Geol. Surv., Washington, 1915.

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Utah in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914,* Part I, pp. v and 717-756. U. S. Geol. Surv., Washington, 1915.

KELLOGG, LOUISE. **Report upon Mammals and Birds Found in Portions of Trinity, Siskiyou, and Shasta Countries, California, with Description of a New *Dipodomys*.** Map, ills, bibliogr. *Univ. of California Publs. in Zoölogy,* Vol. 12, 1916, No. 13, pp. 335-398. [Studies in faunal distribution.]

—— **Los Angeles, January Rainfall in Mountains Near.** *Engineering News,* Vol. 75, 1916, No. 10, p. 461.

MANSFIELD, G. R. **A Reconnaissance for Phosphate in the Salt River Range, Wyoming.** Map. *U. S. Geol. Surv. Bull. 620–O,* pp. 331-349. Washington, 1916.

MCARTHUR, L. A. **Topographic Mapping in the Pacific Northwest.** *Mazama,* Vol. 4, 1915, No. 4, pp. 70-71. Portland, Ore.

—— **Mountain Elevations [in the Pacific Northwest].** *Mazama,* Vol. 4, 1915, No. 4, p. 72. Portland, Ore.

—— **Sacramento River, Propose to Improve the.** *Engineering Rec.,* Vol. 73, 1916, No. 10, p. 323.

Sudworth, G. B. **The Spruce and Balsam Fir Trees of the Rocky Mountain Region.** 43 pp. Maps, ills. *U. S. Dept. of Agric. Bull. No. 327.* Washington, 1916. [The geographic distribution of the principal species is shown in a series of maps. For the method of compilation and discussion see also *Dept. of Agric. Bull. No. 207,* 1915.]

Thiessen, A. H. **The Weather and Climate of Salt Lake City, Utah.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 12, pp. 611-612. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

Roslyn-Clealum Coal Field, Kittitas County. 1:253,440. Accompanies "The Coal Fields of Kittitas County" by E. J. Saunders, *Wash. Geol. Surv. Bull. No. 9,* Olympia, 1914.

Entrance to Harrington Point, Columbia River, west coast of United States. 1:40,000. Chart No. 6151, U. S. Coast & Geodetic Survey, Washington. Edit. of March, 1915. Price, 50 cents.

Point Sur to San Francisco, California. 1:210,000. Chart No. 5402, U. S. Coast & Geodetic Survey, Washington. Edit. of Feb., 1915. Price, 50 cents.

SOUTH AMERICA

Paraguay, Uruguay, Argentina, Chile

Davis, W. G. **Clima de Buenos Aires.** *Anales de la Ofic. Meteorológ. Argentina,* Vol. 15. Part 1: 763 pp.; Part 2, 458 pp. Buenos Aires, 1912.

The weight of the first two parts of Volume 15 of the *Annals* of the Argentine Meteorological Office is 9 pounds and 14 ounces. And there is still a third part to come. Of the more than 1,200 pages, all but about 25 pages are tabular matter. These 25 pages are the administrative reports for 1898 and 1899. Complete as is this presentation of the meteorological data of Buenos Aires, no one can handle these two heavy volumes without asking himself, ''Why were they ever printed?'' That the climate of a single city should have devoted to it nearly ten pounds' weight of paper surely is evidence of the immense numbers of observations which have been taken there, but that there can ever be any scientific use of this data which will be at all proportionate to the expense of publication is inconceivable. Observations prior to 1877 were published in Volume 1 of the *Annals.* The present volume contains the data, *in extenso,* for the several stations in Buenos Aires for varying periods from 1877 on. A note, dated March, 1915, and bearing the signature of the former Director, Mr. Walter G. Davis, calls attention to the fact that these two first parts of Volume 15 have been ready for some time but were not distributed in the hope that the third part, which is to contain the discussion, might be sent out with them. We have no doubt that this remaining third part of the volume, which will be awaited with interest, will be a full and adequate presentation of all that concerns the climate of Argentina's capital city, well up to the high standard of the past volumes of the Argentine Meteorological Office. (For a note on the Service's activities see the April *Review,* p. 301.) R. DeC. Ward.

—— **Argentina: Raccolta di cereali.** *Rapp. dei Agenti Diplom. e Consol.,* No. 23, Dec. 1915, p. 1. Minist. degli Affari Esteri, Rome.

Bazzano, Hamlet. **National Meteorological Institute of Uruguay.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 12, p. 607. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

—— **Chile, Anuario Estadístico de la República de: Vol. 1, Demografía, año 1913.** xxxi and 119 pp. Oficina Central de Estadística, Santiago de Chile, 1914.

Cummings, R. K. **The Land of Fire.** Ills. *The South American,* Vol. 4, 1916, No. 3, pp. 55 and 62. New York. [Tierra del Fuego.]

Dawson, William, Jr. **Rosario.** 6 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 38c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Gallo, H. V. **Reseña sobre los trabajos en el mineral de El Tofo.** *Bol. Soc. Nacional de Minería,* 3rd Series, No. 219, Vol. 27, 1915, pp. 434-439. Santiago, Chile. [The famous iron mines in Coquimbo province, Chile.]

Goehring, Maurizio. **Il Paraguay.** Ills. *L'Esplorazione Commerc.,* Vol. 30, 1915, No. 1, pp. 1-8; No. 2, pp. 45-53; No. 3, pp. 105-114; No. 4, pp. 121-133; No. 5, pp. 176-188; No. 6, pp. 216-226; No. 7, pp. 256-268; No. 10-11, pp. 380-394; and No. 12, pp. 445-448. Milan.

Illanes B., Guillermo. **Mineral de Chuquicamata, de la Chile Exploration Company.** Diagr., ills. *Bol. de la Inspección de Geogr. y Minas,* No. 46, Vol. 11, 1915, pp. 236-270. Dirección General de Obras Públicas, Santiago. [Method of exploitation. See also note on "The Celebrated Copper Mines of Chuquicamata, Chile" in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 693.]

Matta, J. G. **Bosquejo del estado actual de la industria minera del cobre en el estranjero i en Chile.** Diagrs. *Bol. Soc. Nacional de Minería,* 3rd Series, No. 216, Vol. 27, 1915, pp. 118-138; No. 217, pp. 178-204; No. 218, pp. 319-354; No. 219, pp. 357-419. Santiago, Chile.

Matta, J. G. **Critica de las opiniones sustentadas por el señor Santiago Marin Vicuña sobre nacionalización de nuestra industria minera.** *Bol. Soc. Nacion. de Minería,* 3rd Series, No. 220, Vol. 27, 1915, pp. 445-463. Santiago, Chile. [Advocates of the nationalization of the Chilean mineral industry have compared conditions with those obtaining in Sweden. The comparison is here criticized.]

Opazo, G. R. **Los problemas de regardío: Monografía de las principales represas construídas en el país.** *Bol. de la Inspección de Geogr. y Minas,* No. 46, Vol. 9, 1915, pp. 271-283. Dirección General de Obras Públicas, Santiago. [On principal irrigation works of Chile.]

Puelma, M. **Memoria anual del Cónsul General de Chile en la República Argentina correspondiente a 1914.** *Bol. de Relaciones Exteriores,* No. 58, July, 1915, pp. 1-54. Santiago, Chile.

Silva, J. F. V. **La desmembración del territorio argentino en el siglo XIX.** *Bol. Real Soc. Geogr.,* Vol. 57, 1915, No. 4, pp. 474-514. Madrid. [Given in the form of a lecture at the public session on December 3, 1914.]

Singewald, J. T., Jr., and B. LeR. Miller. **A Unique Salt Industry in Chile.** Diagrs., ills. *Bull. Pan American Union,* Vol. 42, 1916, No. 1, pp. 52-60. [Nearness of ground-water level to the surface permits easy extraction of salt on such salars as that of Lagunas, Tarapacá. The salt crystallizes out naturally from ditches cut 8 inches below the water table.]

Mapa de las tribus de los Chacos. 1:3,000,000. Accompanies "El Choroti o Yófuaha" by R. J. Hunt, *Rev. del Museo de la Plata,* H. Young & Sons, Ltd., Liverpool, 1915.

EUROPE

General

Cassi, Gellio. **Il Mare Adriatico: Sua funzione attraverso i tempi.** (Series: Collezione Storica Villari.) xix and 532 pp. Maps. Ulrico Hoepli, Milan, 1915. L. 5.50. 7½ x 5.

Written in an earnest spirit, this account of the part played by the Adriatic in world history pictures clearly the problems related to this inland sea. The lustre shed by the region during the period of Roman greatness and in the medieval days of successful commercial venture is imperishable. The author holds that the Adriatic is an Italian sea. Members of the numerically preponderant Slav communities of the eastern coast would probably take exception to this view, in spite of the cultural inferiority of their kinsmen when compared with Romans or Italians. The case of these Slavs deserves perhaps greater consideration than the Austrian attempts to convert the Adriatic into a pendant of the Teuton heart of Europe—a process which the author describes as artificial. The policy of pitting Slavs against Italians has been resorted to by the German-speaking rulers of the eastren coast to weaken Italian influence. Accordingly, local grievances as well as local aspirations can best be satisfied by the removal of Austrian rule.

The historical value of the work is heightened by the relation, so frequently shown, of the region's history to its geographical structure.

Cram, R. A. **Heart of Europe.** 325 pp. Ills. Charles Scribner's Sons, New York, 1915. $2.50. 8½ x 6. ["Between the Seine and the Rhine."]

Gregory, J. W. **Geological Factors Affecting the Strategy of the War.** *Geol. Mag.,* Decade 6, Vol. 2, 1915, No. 12, pp. 571-572. [Abstract of a presidential address before the Geological Society of Glasgow on Oct. 14, 1915.]

Semple, E. C. **The Barrier Boundary of the Mediterranean Basin and Its Northern Breaches as Factors in History.** *Annals Assoc. Amer. Geogrs.,* Vol. 5, 1915, pp. 27-59. [Abstracted in the March *Review,* p. 220.]

Battle Fields of Today. 16 pages of maps. Rand, McNally & Co., Chicago, 1915. 14 x 10.

On the battle lines [9 maps]. Rand, McNally & Co., Chicago, [1915]. 7½ x 6.

Atlas of the European Conflict, containing [13] detailed maps of the nations [and] pertinent statistics of the contending powers. Rand, McNally & Co., Chicago, 1914. 14 x 10½.

L'Atlas-index de tous les théatres de la guerre: *Ibis,* France et Belgique, avec cartes détaillées du front. 17 pp. of text, 24 maps, and 41 pp. index. Berger-Levrault, Paris, 1915. 8 x 6.

Carte murale du théâtre de la guerre, par L. Gallois. (Collection de cartes murales Vidal-Lablache.) 1:600,000. Armand Colin, Paris, [1915].

Carte murale du théâtre de la guerre européenne, par P. Vidal-Lablache. 1:1,500,000. Armand Colin, Paris, [1915].

Das italienisch-österreichische Grenzgebiet. 1:1,000,000. Inset: Das Küstengebiet des Adriatischen Meeres, 1:2,750,000. Wagner & Debes, Leipzig, [1915].

GERMANY

OTTO, THEODOR. **Der Darss und Zingst: Ein Beitrag zur Entwicklungsgeschichte der vorpommerschen Küste.** Map, diagrs., ills. *Jahresbericht der Geogr. Gesell. zu Greifswald,* Vol. 13, 1911-12, pp. 235-485. Greifswald, 1913.

The peninsula of the Darss on the Baltic coast of Germany includes one of the world's best examples of a cuspate foreland of somewhat complicated type. Several low islands, bordering an irregular shoreline of submergence, were early united by wave-built bars to form a complex tombolo, from the northwestern side of which the present foreland was prograded by the successive addition of parallel beach ridges. Dune sand later accumulated on each beach ridge, raising many of them to an altitude of fifteen feet or more above the intervening swales. The ridges are now well forested (see Fig. 1), and a large portion of the foreland is included in a private hunting preserve of Prinz Eitel Friedrich.

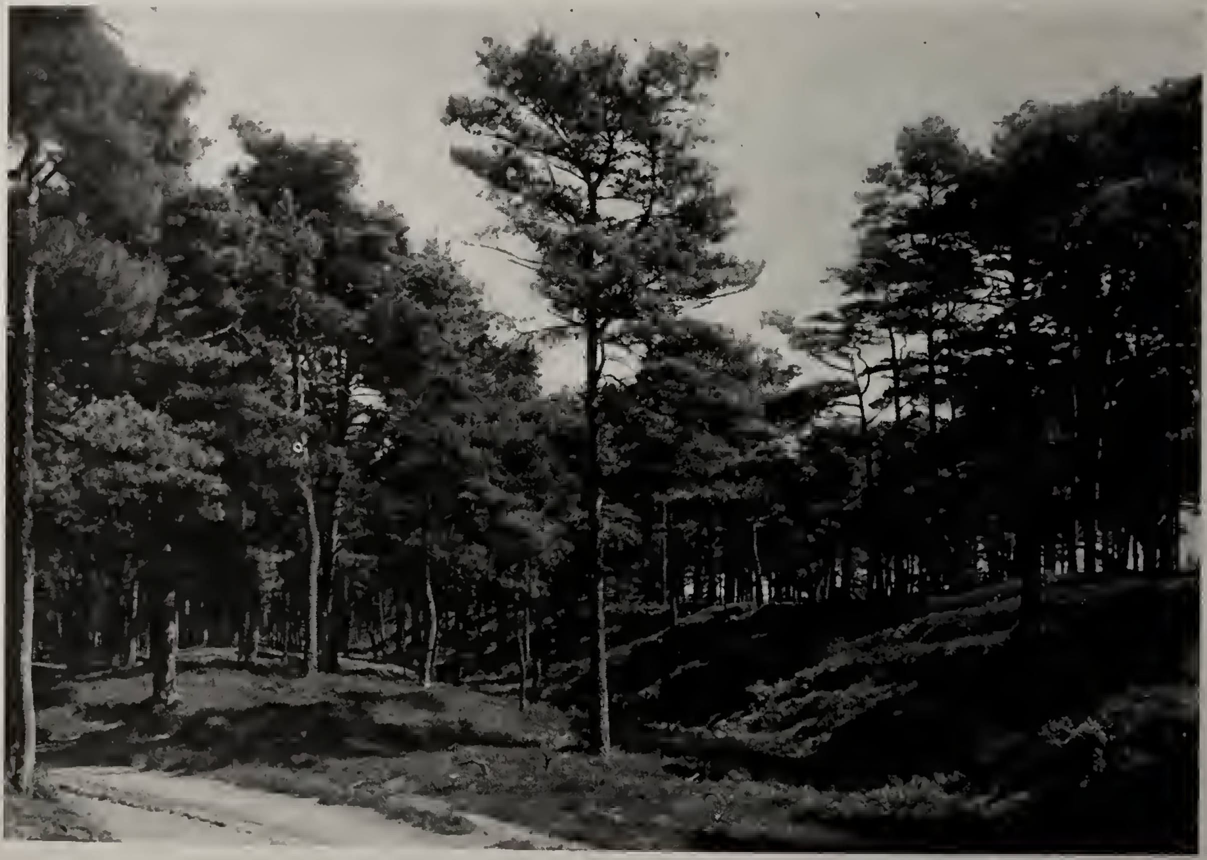

FIG. 1—Forested dune ridges on the Darss foreland. (Photo by D. W. Johnson.)

The dune ridges of the Darss closely resemble those of Cape Canaveral and are of more than ordinary interest to the geographer. The present excellent essay by Theodor Otto is based upon a comparative study of ancient and modern maps and upon detailed field investigations; and the author discusses at length the preglacial conditions of the region involved, the effects of glaciation and of preglacial changes of level upon the coastal topography; and finally the more recent morphological changes of the coast, including the development of the dune ridges. It appears from Otto's essay that there are 121 dune ridges distinguishable in passing from south to north along the western side of the Darss, only a part of which number are indicated on the German topographic map of the area (Karte des Deutschen Reiches, 1:100,000, Sheet No. 62, Barth). Historical evidence proves that the coast advanced 1,300 feet in 2,000 years. Using this figure as a basis for calculation, Otto concludes that 3,000 years is the shortest possible time in which the 121 ridges could have been constructed. 1,000 additional years are allowed for the formation and subsequent destruction of certain older ridges near the base of the foreland; and Otto thus concludes that a total of at least 4,000 years was required for the development of the ridged foreland. It may be noted that Keilhack, in a study of the dune ridges of Usedom and Wollin (Die Verlandung der Swinepforte, *Jahrbuch der Kgl. Preussischen Geol. Landesanstalt für 1911* (Vol. 32, pp. 209-244, 1912), estimated 7,000 years as the time necessary for the development of that remarkable series. As both series of ridges are believed to have been initiated by the submergence known as the "Litorinasenkung," it would seem that the present shoreline of submergence dates back from four to seven thousand years. Since that time there has been no marked change in the level of land and sea along the Baltic coast of Germany, as otherwise the older ridges would be either submerged or raised well above the level of those last formed.

The reader will have some difficulty in following Otto's arguments because he locates important features and describes essential measurements in terms of unimportant local roads, property boundaries, etc., the names of which do not appear on any maps in his reports nor on any other maps which the reviewer has been able to find. Otherwise the report is well illustrated with geological maps and diagrams and a dozen typical photographs of the region. D. W. JOHNSON.

GENZMER, MARTHA. **Das Fischergewerbe und der Fischhandel in Mecklenburg vom 12. bis zum 14. Jahrhundert.** Bibliogr. *Archiv für Fischereigeschichte,* 1915, Oct., No. 6, pp. 157-212. Berlin.

LAY, J. G. **Germany's Exports to United States in 1915.** *Commerce Repts.,* 1916, No. 47, pp. 792-795. Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C., 1916.

LUDWIG, WILHELM. **Der Einfluss des Krieges auf die deutsche Seeschiffahrt.** *Weltwirtschaft,* Vol. 5, 1915, No. 9, pp. 187-191. Berlin.

MARTELL, P. **Zur Geschichte der Perlenfischerei in Sachsen.** *Archiv. für Fischereigeschichte,* 1915, Oct., No. 6, pp. 248-253. Berlin.

SCHMUTZER, —. **Zur Geschichte der Fischerei im Flussgebiet des Regen (Oberlauf).** *Archiv. für Fischereigeschichte,* 1915, Oct., No. 6, pp. 254-259. Berlin.

RUSSIA

FRIEDERICHSEN, MAX. **Die Grenzmarken des Europäischen Russlands, ihre geographische Eigenart und ihre Bedeutung für den Weltkrieg.** 148 pp. L. Friederichsen & Co., Hamburg, 1915. 9½ x 6½.

Professor Friederichsen's book is the product partly of his own experiences in travel in Russia (1897, 1902) and partly of the work started in Germany in 1913 by the "German Society for the Study of Russia." In spite of the fact that the activities of the society have been postponed indefinitely because of the war, this book was published as its analytical studies of the Russian frontier have a direct bearing on the present situation.

The introductory chapter deals with Russia as a whole, its expansion from the earliest days, its actual area, the size and character of the population. Then follow chapters taking up the various regions in detail, beginning with Finland. The author first outlines the geology of the country and then accords a brief paragraph each to climate, vegetation, natural resources, and population, before going more fully into what he designates as the political-geographical side of Finland. These paragraphs have distinctly more of the political than of the geographical in their character and are hardly written in what is usually called the cold light of science. A concluding page deals with the geographical conditions from the point of view of military manoeuvres, weighing the possibilities and the impossibilities of handling an army in a country of a thousand lakes, marshes, rivers, and forests.

In like manner, and with greater or less detail, he describes in turn the Baltic Provinces, Poland, Little Russia, and finally the Caucasus, laying particular emphasis on Armenia. Scattered throughout the book there is a certain amount of useful information, but the interlardings of political propaganda are so frequent and copious that one is soon aware of the fact that in this case science is but the shell used to contain much extraneous matter.

E. K. Reynolds.

Balkan States, including Rumania

Quinn, D. D. **Helladian Vistas.** 407 pp. Yellow Springs, Ohio, 1908. 8 x 5½.

The title is a good index to the content and character of the book, for it is a series of sketches. As the author says (p. 4): ''These essays present, in a loosely correlated way, all kinds of information connected with the long life of a portion of the Greek nation.'' The chapter headings include such widely separated topics as The Acropolis of Athens, The Games at Olympia, The Mystic Rites of Eleusis, Delphi, Kephallenia, Pan-Hellenic Writing in the Aegean, The Hill of Hissarlik, The Maniats, The Church of Greece, The Land of the Klephts, Higher Education in Greece of Today, etc. Though so versatile in the choice of topics, the author has not aimed to be universal. Thus, though describing in detail each of the Ionian islands, he does not include any of those of the Aegean nor Crete.

The writer throughout shows a deep love and sympathy for his subject, a wide knowledge and impartial use of sources, and, best of all, a first-hand acquaintance with the places described, which is especially valuable in the case of such little-known parts of Greece as Ithaca, Maina, Agrapha, and the Pindus region. He has a fascinating English style, and his attention is often drawn by curious and recondite bits of history and lore—one of the attractions of the book. Thus in Zante he mentions the curious wells of pitch and how his guide gathered the pitch by dipping in a bunch of leaves tied to the end of a pole, exactly as is described in the pages of Herodotus. He speaks of the peculiar ownership of olive groves on Leucas (pp. 282-283), and the use of Leucadian red wine in export (p. 285) to France and Italy to darken their wines and says it is ''so full of color that one could easily write with it.''

The book is full of knowledge of every sort—perhaps too full. The author aims to tell in detail the historical setting of every place he visits. Thus it must lack the delicate and comprehensive touch of Mahaffy's ''Rambles,'' or the personal anecdotes of Manatt's ''Aegean Days,'' or the joyous freshness of Richardson's ''Vacation Days in Greece,'' and the compelling charm of Mrs. Bosanquet's recent book. Doctor Quinn gives few personal experiences, is almost epic in his desire to efface himself from his pages, and is content to let the places visited tell their own tale. The lack of photographs, to help the reader reconstruct the scenes so beautifully described, is a real loss.

Certain of his descriptions, as those of the views from the top of Pankrator on Corfu (pp. 240-241) and Aenos on Cephallenia (pp. 317-318) are excellent; sometimes, as in describing the savage scenery of Tempe, he is even poetic. What he says of ancient notions of scenery can now be supplemented by a recent article of the reviewer, entitled ''The Ancient Appreciation of Mountain Scenery'' (*Classical Journ.*, Vol. 11, 1915-16, No. 2, pp. 70-84). His insight into the character of the Greek of today is constantly shown, e. g. on page 282, where, in speaking of the custom of the Leucadian grandee to while away an hour with his friends at the café in talking politics, he pictures him as ''like a true Greek, condemning everything, without, however, expressing or even possessing an opinion of his own on the matter under discussion.''

In reviewing a popular book so charmingly written as this it seems wrong to offer more than very general criticisms. In the ''Games at Olympia'' the author has rightly exposed the fallacy, still appearing in every textbook of ancient history, that the Greeks were never united, by affirming that they were as closely united, though in a very different way, as the citizens of any modern state. He is right in saying that phyletic union is a far nobler kind than the equality of fellow subjects. However, he does not give due prominence to the political leadership of Athens in the modern sense, which grew out of the Delian league, for, in a passage in which he says it was a mistake to have chosen the present as the capital of Greece, he says (p. 19) that this was an honor ''which in all her long and varied history had never before fallen to the lot of Athens, to be a capital of a state.''

His ethnological views are not always tenable. Just why he should say (p. 174) that the presence of Slavonic place-names in Arcadia is ''one of the mysteries of Arcadian and mediæval Greek history in general'' is not clear. Nor are his doubts about the origin and language of the Vlachs of Great Vlachia in the Pindus well founded. He says they may be akin to the Wallachians of Rumania, but that there is not the slightest proof that they came into the Pindus and Othrys from the Danubian provinces, and he professes to be in complete ignorance about their original home, and only their speech is Latin; ''whether they are of Greek descent or not has not been ascertained. Their ethnic origin is as much open to dispute as is that of the

Roumanians themselves'' (p. 166). He is here evidently a disciple of Roesler, whose work ''Romanische Studien'' (Leipsic, 1871) absolutely denied the claims of the Rumanian and Transylvanian Vlachs to be regarded as descendants of Trojan's Dacians. This theory at first commanded wide acceptance and was even utilized in Hungary as a plea for refusing parity of treatment to what was looked upon as a race of comparatively recent intruders. But Rumanian scholars (e. g. J. L. Pic: Über die Abstammung der Rumänen, Leipsic, 1880; and A. D. Xenopol: Les Roumains au moyen âge, Jassy, 1886) showed the fallacy of Roesler's conclusions, which were received in Rumania much as Fallmerayer's notions of the ethnology of the Greeks had been received long before in Greece—as a direct attack on their nationality. Doubtless the truth of the matter lies somewhere between the two extremes. Despite the long predominance of Greek, Slav, and Turk influence, no valid objection can be made to the claim of the half million Vlachs, scattered south of the Danube over Macedonia and northern Greece, that they are of Latin origin in language and culture and to some extent also in descent. Competent ethnologists of today generally accept it. It is not the Latin descent of the Vlachs which is hard to prove, but their place of origin and early migrations. That they were in Thessaly by the eleventh century is attested by Anna Comnena, who mentions *Megale Vlachia* then; and in the next century they were described by the Jew Benjamin of Tudela.

Perhaps the one thing in the book with which the classical scholar would find serious fault is Doctor Quinn's mode of transcribing ancient Greek names. The use of *k* for *c* and the endings *-os* and *-on* for the more usual *-us* and *-um* (e. g. Kallimachos, Byzantion) is merely a matter of taste and quite proper. But why assimilate only the dipthongs *eu* and *au* into the Romaic pronunciation *ev* and *av* and not consistently rewrite the consonants? Thus he writes Evripides, Odyssevs, Zevs, Evboean, Elevsis, and even Peiræevs; also Pavsanias, Aristonavtes, Navplion. Of course sometimes in certain combinations we should have *ef* and *af*, and so write Pafsanías and, with the necessary consonant changes, Otheesefs and Evripithes. The initial consonant *beta* is left though it is now pronounced as a *v;* so instead of Doctor Quinn's Bolos, we should have Volos (especially as the town is scarcely a hundred years old and has no ancient equivalent), and instead of Belestino we should have Velestino. The word constantly spelled *katabothron* should be written *katavothron*—as it is not an ancient Greek word. The names of the Ionian islands Corfu, Cephalonia, and Zante, coming to us through the Italian, would also seem preferable to their little-known Greek names Kerkyra, Kephallenia, and Zakynthos in a popular work of this sort. Mainotes is better known than Maniats and Romaeic should consistently replace Romaean and Kladeos should be written for Kladoas, Olympic for Olympiac; nor are the shortened forms Palaeolog, Dikearch, Phenik (p. 112) naturalized in English; he even gives Akadem (p. 18). Such inventions as Bulgarmen, Delphmen, Mykenlanders, Greekland (three times on p. 354) and un-Greekly, are doubtful at best.

But despite such minor defects, ''Helladian Vistas'' is an excellent book and should claim a large circle of readers.

Walter Woodburn Hyde.

—— **Patras, Consular District of (Comprising the Morea and the Provinces of Ætolia and Acarnania), Trade of the, Report for the Year 1914 on the.** 12 pp. Map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5556. London, 1916.

AFRICA

Sahara, including Egypt

Balls, W. L. **Egypt of the Egyptians.** xvi and 266 pp. Maps, ills., index, bibliogr. Charles Scribner's Sons, New York, 1915. 7½ x 5½.

Mr. Balls has here compacted a great amount of information and made it readable. He scarcely gives so vivid a picture of Egypt in the large as Sydney Low in his latest book, but he discusses so fully such matters as irrigation and its processes; climate; crops and machinery; the varied population, including the *fellaheen,* the Bedouin, and the foreigner; the past, the present, and the hoped-for future of the ancient land, that he materially helps us to visualize what Egypt has been and is and what it may become. It is a small book, easy to handle and packed with well-arranged facts and helpful comment.

The author might, with advantage, have enlarged upon the data he gives concerning the *sudd* of the upper White Nile which holds the waters from the equatorial lakes till more than half the volume evaporates. What Egypt needs for the reclamation of more land is all the water it can get. It is the present policy of the British occupation to secure this water by closing all the inlets into the marshes and widening and deepening the channel. The *sudd* itself may be turned to good account. Just before the war, a method was discovered of converting dried and pressed blocks of this floating vegetation into fuel and a company was beginning to carry out the process.

CYRUS C. ADAMS.

DE KUSEL (BEY), BARON. **An Englishman's Recollections of Egypt, 1863 to 1887, With an Epilogue Dealing With the Present Time, 1914.** xvi and 352 pp. Map, ills., index. John Lane Co., New York, 1915. $3. 9 x 6.

The memoirs of an English gentleman, former English controller-general of Egyptian customs. He went to Egypt at the age of fifteen and began life as accountant and paymaster in an Egyptian cotton mill. Two years afterwards he secured a position with an English firm of merchants and steamship agents at Alexandria. Seven years later he entered the Egyptian customs service and was appointed chief of the administrative department. His personal experiences gave him an inside view of more recent Egyptian history. He sums up England's work in Egypt in a few words: "The *fellaheen* know full well how they have been treated in the past: for the slightest offence they have been whipped with the *kourbash,* taxed over and over again, deprived of their lands, and treated with the greatest injustice. Now they are treated with the greatest justice, taxed equally, and are treated as human beings."

BIANCO, M. Z. **Il Canale di Suez nel 1914.** 17 pp. [*Boll.*] *Direz. Gen. degli Affari Commerc.,* 1915, No. 18. Minist. degli Affari Esteri. Rome.

CAMPANI, ROMEO. **La terminologia geografica degli Arabi, con speciale riguardo alla toponomastica della Libia.** *La Geogr.,* Vol. 3, 1915, No. 1-2, pp. 34-47; No. 7-10, pp. 337-347. Novara.

CATALANI, GIACOMO. **Zavia (Garbìa).** *L'Esplorazione Commerc.,* Vol. 30, 1915, No. 1, pp. 22-27; No. 4, pp. 133-138; No. 7, pp. 273-279; No. 10-11, pp. 419-424; No. 12, pp. 457-461. [Zavia is a coastal town 25 miles west of Tripolis.]

—— **Egypte, Bulletin mensuel du commerce extérieur de l', avec appendice sur le Soudan: Décembre 1915.** (Vol. 29, No. 12.) 35 pp. Direction Générale des Douanes Egyptiennes, Alexandria.

MADAGASCAR AND ADJACENT ISLANDS

CARLE ET GOHIER, G. **Contribution à l'étude des terres de la côte est [de Madagascar].** *Bull. Écon. du Gouv. Gén. de la Colon. de Madagascar et Dépend.,* Vol. 15, 1915, No. 1, pp. 35-41. Tananarive.

DE LA BATHIE, P. **Études et recherches pour la captation des eaux thermales d'Antsirabe [Madagascar].** Map, diagr. *Bull. Écon. du Gouv. Gén. de la Colon. de Madagascar et Dépend.,* Vol. 15, 1915, No. 1, pp. 93-103. Tananarive. [Contains notes on the geology, accompanied by a contoured geological map, 1:100,000.]

FAVIER, —, AND VIDAL, —. **Les plantes de Madagascar propres à la fabrication du papier: Études faites à l'École Française de Papeterie.** *Bull. Écon. du Gouv. Gén. de la Colon. de Madagascar et Dépend.,* Vol. 15, 1915, No. 1, pp. 80-87.

—— **Madagascar, Étude sur la sériciculture à.** *Bull. Écon. du Gouv. Gén. de la Colon. de Madagascar et Dépend.,* Vol. 15, 1915, No. 1, pp. 1-17. Tananarive.

—— **Mauritius: Report for 1914.** 36 pp. Map. *Ann. Colonial Repts. No. 875.* London, 1916. [With a record crop and high price, the sugar industry of the island is in a sound financial condition.]

ROULLEAU, A. **L'arboriculture fruitière d'Europe: Son application et ses résultats en Emyrne, [Madagascar].** *Bull. Écon. du Gouv. Gén. de la Colon. de Madagascar et Dépend.,* Vol. 15, 1915, No. 1, pp. 18-34. Tananarive.

ASIA

TURKEY IN ASIA, ARABIA, CAUCASIA, IRAN

BISSOLI, LUIGI. **Alcune notizie di geografia commerciale sulla Persia.** *L'Esplorazione Commerc.,* Vol. 31, 1916, No. 1, pp. 1-10.

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ENRICO, DELLA VALLE. **Grandezza e decadenza del popolo Ottomano.** *Riv.*

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Malay Archipelago, including the Philippines

Brouwer, H. A. **On the Granitic Area of Rokan (Middle-Sumatra) and on Contact-Phenomena in the Surrounding Schists.** Map, diagrs. *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam*, Vol. 17, Part 2, pp. 1190-1202. June, 1915.

Coronas, Jose. **Philippine Islands: Meteorological Bulletin for June, 1915.** pp. 103-119. Map. Weather Bureau, Manila, 1915.

Heekeren, E. A. A. van. **Nederlandsch Oost-Indië in 1915.** *De Indische Gids*, Vol. 38, 1916, No. 2, pp. 178-189. [Review of economic development.]

H[eekeren], E. A. A. v[an]. **Jaarverslag van den Topografischen Dienst in Nederlandsch-Indië over 1914.** *De Indische Gids*, Vol. 38, 1916, No. 1, pp. 31-35. [A review of the report for 1914 of the Topographical Bureau of the Dutch East Indies.]

Moulton, J. C. **An Account of the Various Expeditions to Mt. Kinabalu.** Map. *Sarawak Museum Journ.*, Vol. 2 (Part 2), 1915, No. 6, pp. 137-176. [Summary accounts of all the ascents made by Europeans from the first in 1852 to the author's own climb of 1913. For an account of the plant formations of this peak in British North Borneo see the paper by L. S. Gibbs listed in the Feb. *Review*, p. 162.]

Wichmann, A. **On the Tin of the Island of Flores.** Map. *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam*, Vol. 17, Part 1, pp. 474-490. Dec., 1914.

Wichmann, A. **On Some Rocks of the Island of Taliabu (Sula Islands).** Diagrs. *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam*, Vol. 17, Part 1, pp. 226-239. Dec., 1914.

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Der westliche Teil von Seran, nach den Aufnahmen von O. D. Tauern, E. Stresemann und eigenen, mit Benützung einer holländischen Aufnahme des Uligebietes und der von Leutnant 1. Kl. W. K. H. Feuilleteau de Bruin aufgenommenen Route Honitetu-Kairatu, entworfen vor K. Deninger. 1:125,000. Pl. 50, *Petermanns Mitt.*, Oct., 1915. [See also maps listed in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 75 and 397-398.]

Anchorages west and south of Mindoro, P[hilippine] I[slands]. (1) Sablayan Anchorage and Pandan Bay, west coast of Mindoro; (2) Semirara Anchorage, west coast of Semirara Island; (3) Apo Reef, Mindoro Strait. 1:20,000. Chart No. 4337, U. S. Coast & Geodetic Survey, Washington. Edit. of Jan., 1916. Price, 30 cents.

PHYSICAL GEOGRAPHY

Hydrography and Oceanography

Hesselberg, T., and H. U. Sverdrup. **Beitrag zur Berechnung der Druck- und Massenverteilung im Meere.** 17 pp. *Bergens Museums Aarbok 1914-1915: Avhandlinger og Aarsberetning*, No. 3, Art. 14.

Hesselberg, T., and H. U. Sverdrup. **Die Stabilitätsverhältnisse des Seewassers bei vertikalen Verschiebungen.** 16 pp. *Bergens Museums Aarbok 1914-1915: Avhandlinger og Aarsberetning*, No. 3, Art. 15.

McEwen, G. F. **The Application of Physical Principles to Problems Suggested by Oceanic Circulation and Temperatures.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 620-621. [Abstract of a paper presented at the San Francisco joint meeting of the Physical Society and Section B of the A. A. A. S., Aug. 2-7, 1915.]

METEOROLOGY AND CLIMATOLOGY

HENNIG, R. **Vom Wetter: Gemeinverständliche Betrachtungen über Wind und Wetter und ihr Einfluss auf den Krieg.** 96 pp. Deutsche Naturwissenschaftliche Gesellschaft, Leipzig, 1915. M. 1. 8½ x 5½.

Weather conditions have exercised a control over military operations ever since human wars and battles began. The control is so universal, so important, so critical, that for a military staff to neglect the weather factor in warfare may be as disastrous as a failure to provide food, or water, or ammunition. Singularly little has been written on this subject, although history is full of illustrations of weather influences in wars. The present reviewer has already published several articles on the importance of the weather factor in the present war. This is the first book to discuss the topic.

Doctor Hennig has done exactly what the title of his little volume implies. He has given a simple and popular presentation of various types of weather. He has shown, by means of numerous historical references, the relation which has appeared in past wars between weather conditions and military operations. And he has not neglected to include numerous cases in the present war where such relations have been clearly observed. So far as possible, the author has worked out from the available data the actual meteorological conditions which prevailed during the first year of the war, and has thus been able to compare these with the usual, normal conditions. He shows, for example, that the winter of 1914-15 was, on the whole, an unusually mild one, the minimum temperatures in eastern Europe having generally been 15°, or more, higher than the average.

About one-third of the book deals with the control of battles and campaigns by cold, heat, thunderstorms, rain, fog, and storm. A few pages are devoted to the supposed effect of battles upon the weather. The conclusion, of course, is that there is absolutely no evidence, statistical or theoretical, in favor of the view that wars in general, or the present war in particular, have ever had even the slightest influence upon the weather. The hygiene of precipitation, frost protection, hail damage, fear of and danger from thunderstorms, Christmas-tide weather, and several other topics of popular interest are briefly and clearly discussed. Doctor Hennig's little book is easily read, interesting, and instructive. It will set its readers right on a good many widespread meteorological errors and superstitions. And it puts emphasis upon the human importance of the conditions with which it deals. R. DEC. WARD.

LITRE, E. **La science de l'air: Notions nouvelles et utilisation.** *Bull. Soc. de Géogr. de Toulouse,* Vol. 34, 1915, No. 2, pp. 134-151.

MCADIE, ALEXANDER. **Battles and Rainfall.** *Scientific Monthly,* Vol. 2, 1916, No. 2, pp. 170-173.

—— **Radio-Active Substances in the Air and Atmospheric Fog: A Study of Atmospheric Conditions of Importance to the Aviator.** Map, diagr., ills. *Sci. Amer. Suppl.,* No. 2089, Vol. 81, 1916, Jan. 15, pp. 37-38.

WELLS, E. L. **The Economic Aspect of Climatology.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 12, pp. 612-613. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HUMAN GEOGRAPHY

ANTHROPOLOGY AND ETHNOLOGY

ELLIOT, G. F. S. **Prehistoric Man and His Story: A Sketch of the History of Mankind from the Earliest Times.** 398 pp. Diagrs., ills., index. Seeley, Service & Co., Ltd., London (J. B. Lippincott Co., Philadelphia, Amer. Agents), 1915. $2. 9 x 5½.

A summing up of our present knowledge concerning prehistoric man, drawn from every field of science. The book is somewhat removed from the ordinary by the happy welding of geological, anatomical, zoölogical, archeological, and ethnological facts. Man's ascent by successive steps of achievement is recorded, and there is a subtle appeal in the imaginative description of the life of our primitive ancestors.

There is here and there an occasional insight into the relations of the savage to his environment. But the want of a better grasp of this subject is felt in the chapters on the occupation of world-areas. The author has evidently not drawn on geography to the extent to which he has assumed indebtedness to other sciences.

The title of "The American Puzzle" given to the pages dealing with New World conditions hardly seems warranted any longer, in view of Hrdlička's discoveries in Asia during 1912. Had stress been laid on the fundamental unity of the Pacific region the problem of its peopling would have been presented in its proper light. In spite of such shortcomings, the laborious task of reconstitution undertaken by the author has been on the whole ably achieved.

ELLIOT, G. F. S. **Prehistoric Man.** *Proc. Royal Philos. Soc. of Glasgow,* Vol. 45, 1913-14, pp. 17-27.

HAHN, EDUARD. **Menschenrassen und Haustiereigenschaften.** *Zeitschr. für Ethnologie,* Vol. 47, 1915, No. 2-3, pp. 248-257. Berlin. [Comparison of environmental influences on man and on domestic animals along the lines of the author's suggestive "Die Haustiere und ihre Beziehungen zur Wirtshaft des Menschen: Eine geographische Studie," 1896.]

ROOSEVELT, THEODORE. **How Old Is Man?** Maps, ills. *Natl. Geogr. Mag.,* Vol. 29, 1916, No. 2, pp. 111-127. [A review of "Men of the Old Stone Age: Their Environment, Life, and Art," by Henry Fairfield Osborn, New York, 1915.]

WOODWARD, A. S. **A Guide to the Fossil Remains of Man in the Department of Geology and Palæontology in the British Museum.** 33 pp. Ills., bibliogr. London, 1915.

ECONOMIC GEOGRAPHY

TODD, J. A. **The World's Cotton Crops.** xiii and 460 pp. Maps, diagrs., ills., index. A. & C. Black, Ltd., London, 1915. 10s. 8 x 5½.

The author holds that the world is facing an increasing demand for cotton, a demand due to the spread of civilization and its consequent demand for more clothes, to the substitution of cotton for the more expensive woolen, linen, and silken fabrics, and to the constantly widening use of cotton cloths in new industries. All the cotton-producing regions of the world are described and illustrated with excellent maps, statistical tables and graphs, but especial emphasis is given to the United States, India, and Egypt, the latter two because of their importance as cotton-producing British colonies.

Broadly considered, the author divides the world's cotton into five grades: Sea Island cotton of South Carolina and the West Indies; Sea Island cotton of Georgia and Florida; Egyptian cotton; American upland cotton; and, lowest in grade, Indian cotton. The American upland (short staple) cotton includes sixty per cent of the world's supply. The prices show a greater increase than the production, thus showing a demand that, on the whole, has increased faster than the supply. The increasing cost of production according to the author's analysis is due to the boll weevil and to the inefficient negro labor so largely employed in the South.

Indian cotton is of poor quality and does not reach the world's markets in large quantities. Egyptian cotton is of good quality, and the arable lands are being increased by irrigation, especially since the building of the Assuan dam. An interesting problem has appeared in connection with Egyptian irrigation. With the increase of water for irrigation there is a rise of subsoil water so that drainage ditches have become almost as necessary as irrigation canals. Another very interesting fact hitherto not known to the reviewer is that recent observations in Egypt show a tendency toward a seven-year cycle of the Nile overflows, seven years of plentiful water followed by seven years of less plentiful water—a condition well known in our subarid West. There are chapters on the uses of cotton and cotton seed.

A final chapter is given to the effects of the great war on the cotton situation. Production in the United States has already been reduced because of the war, and at the close of the war there will probably be a heavy demand from the warring nations for cheap cotton goods to take the place of the more expensive goods that were formerly consumed. The author is inclined to doubt if the production of raw cotton will quickly rise to meet the probable increased demand. F. V. EMERSON.

DRYER, C. R. **Natural Economic Regions.** *Annals Assoc. Amer. Geogrs.,* Vol. 5, 1915, pp. 121-125. [Abstracted in the May number, p. 378.]

SHOWALTER, W. J. **How the World is Fed: (A Practical Analysis of the Food Supply of the World, of the Relations of War and Science Thereto, and of America's Great Contribution to Humanity's Market Basket.)** Ills. *Natl. Geogr. Mag.,* Vol. 29, 1916, No. 1, pp. 1-110. [With over one hundred illustrations.]

HARPER, E. H., AND ALLAN FERGUSON. **Aerial Locomotion.** (Series :The Cambridge Manuals of Science and Literature.) viii and 164 pp. Diagrs., ills., index, bibliogr. Cambridge University Press, London, 1911. 40 cts. 7 x 5.

HISTORY OF GEOGRAPHY AND EXPLORATION

McClymont, J. R. **Pedraluarez Cabral (Pedro Alluarez de Gouvea): His Progenitors, His Life, and His Voyage to America and India.** 73 pp. Bernard Quaritch, London, 1914. 9 x 7½.

The geographical part of the volume takes the form of a brief and not very enlightening commentary on the voyage of Cabral, Vasco da Gama's not too fortunate successor, followed by translations of relevant documents, such as the Royal Instructions for Trading with the Indies, as appendices. Whatever may be the opinion on Cabral's East Indian policy (see A. G. Keller's "Colonization," p. 92), his voyage, as the author points out, is marked by two notable achievements—the effective discovery of Brazil for Portugal and a knowledge of the climate of the South Atlantic that proved of great service to succeeding navigators.

McGee, E. R. **Life of W J McGee.** 240 pp. Ills., bibliogr. Privately printed, Farley, Iowa, 1915. $2.00. 8 x 5½.

As a biography this book is defective both in literary style and in analysis of a many-sided character whose geographic papers are of high rank; but the author—sister of the late W J McGee—at least gives detailed descriptions of the early life of the subject which are both intimate and valuable. There is a bibliography of 111 titles, arranged in chronological order except for about sixteen titles (some dated 1911) taken out of sequence and put without order at the beginning of the list.

An important feature of the work is a series of extracts from McGee's principal writings. Among them are such famous papers as "The Seri Indians" and "Desert Thirst as Disease." The last writing included is "Symptomatic Development of Cancer"—a few notes on the growth of the disease which finally ended the author's life.

Churchill, William. **Memoir of William W. Rockhill.** *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 131-133.

Clarke, J. M. **The Reincarnation of James Eights, Antarctic Explorer.** *Scientific Monthly*, Vol. 2, 1916, No. 2, pp. 189-202. [Eights, a native of Albany, N. Y., was a member of Fanning's expedition of 1830 and made accurate observations on the geology of the South Shetland islands. Although appointed geologist of the Wilkes Exploring Expedition of 1840, he was in the last moment omitted from its scientific staff. This failure marked the end of his scientific career, although he lived until 1882.]

EDUCATIONAL GEOGRAPHY

Kahn, Joseph, and J. J. Klein. **Principles and Methods in Commercial Education: A Text-Book for Teachers, Students and Business Men.** xiv and 439 pp. Index. The Macmillan Co., New York, 1914. $1.40. 8 x 5½.

This volume, by two authors of much special experience, appears to be a timely and strong exposition of a theme of growing importance. It is designed to give a pedagogical foundation to the teacher and a wider outlook to the man of business. Part I is general and deals with the value of a business education, the course of study in secondary commercial schools, and the general principles of method. Part II constitutes most of the volume and is devoted to special fields. Among them are arithmetic, office practice, bookkeeping, commercial geography, commercial law, economics, business English, and stenography.

Commercial geography is characterized as the broadest of all the subjects in the curriculum. The difficulty is emphasized of dealing with principles rather than facts of memory, as also the importance of an introductory course in local industries. Concrete suggestions are given on the method of such study. Many other sub-topics are well treated, as for example the physiographic conditions which influence commerce, human factors in commerce, selection and organization of material, use of text and reference books, observation trips and commercial museums, maps and graphs. Each chapter closes with practical exercises and a bibliography. Albert Perry Brigham.

Hanna, J. C. **General Science and Geography in the High School.** *School Sci. and Math.*, Vol. 16, 1916, No. 3, pp. 210-217.

von Engeln, O. D., and L. A. Hausman. **An Automatic, Intermittent Eruption, Artificial Geyser.** Diagrs., ills. *School Sci. and Math.*, Vol. 16, 1916, No. 2, pp. 116-122. [Directions for the construction of a geyser model.]

Whitbeck, R. H. **Geography as a Preparation for Citizenship.** *School Sci. and Math.*, Vol. 16, 1916, No. 4, pp. 323-327.

Wunderlich, E. **Geographische Universitäts-Ferienkurse.** *Geogr. Anzeiger*, Vol. 16, 1915, No. 12, pp. 359-360.

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